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TOXICS IN THE COMMUNITY - NATIONAL AND LOCAL PERSPECTIVES

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National and Local Perspectives

The 1988 Toxics Release Inventory National Report

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COMMENTS ON THIS NATIONAL REPORT

EPA continually evaluates and tries to improve the Toxics Release Inventory and the means by which it makes TRI available to the public. This National Report is one of the key means of disseminating TRI data, and the Agency would greatly appreciate feedback on the usefulness of this report, and of ways to improve it in the future.

We would like to learn the ways in which the general public, environmental groups, industry, state governments and others are using TRI and the National Report. Examples of successful efforts to put TRI to use will help us evaluate the program's strengths. Examples of difficulties experienced by those attempting to use the information in this report, or in TRI generally, will help us improve our future efforts.

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TOXICS IN THE COMMUNITY

1988

NATIONAL AND LOCAL PERSPECTIVES

A report on data collected under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986.

EPA
United States Environmental Protection Agency
Office of Toxic Substances
Economics and Technology Division
Washington, DC 20540
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PROJECT STAFF

PROJECT MANAGER: **David Sarokin**
EPA Office of Toxic Substances
Economics and Technology Division

DATA ANALYSIS AND REPORT PREPARATION
***Hampshire Research Associates*, Inc.**

Jacqueline B. Courteau, *Editor*
Sheila A. Ferguson, *Assistant Editor*
Catherine G. Miller, *Senior Analyst*
Barbara F. Bass
Carroll L. Bastian
Carol M. Benes
Matthew J. Carlin
Donna Churyk
Michelle S. Cook
Richard Harrington
Kevin A. Hiscock
Marcellus Hynes
Lauren E. Kenworthy
Laurie C. Meree
Warren R. Muir
Minh Huu Son
Collene K. Spilker
Jan E. Storm
Nancy M. Waugh
John S. Young
Qinghua Zhao

COVER PHOTO BY: Daniel J. Kasztelan

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FOREWORD

This marks the second year EPA has published the Toxics Release Inventory (TRI) collected pursuant to the Emergency Planning and Community Right-to-Know Act of 1986. TRI is an annual, publicly available compilation of information on the release of toxic chemicals by manufacturing facilities in the U.S. This report summarizes the second year of TRI data-where, how much, and which types of toxic chemicals are being released into the environment-and provides comparisons to the first year's releases.

This current report confirms my belief that, after nearly two decades of progress toward better air and water quality through the treatment and disposal of wastes, we still have a long way to go. As important as it is, pollution control can bring us only so far. By emphasizing pollution prevention-finding ways to eliminate the formation of toxic pollutants in the first instance-we can improve protection of the environment, reduce risk to health, and avoid much of the expense and frustration inherent in managing or treating wastes.

You will read in this report that total releases in 1988 were lower than in 1987. Despite the heightened awareness that TRI has encouraged, and some voluntary reduction efforts by industry, this does not necessarily mean less pollution. After the initial experience with the TRI requirements, many facilities have refined the way they measure or keep track of releases. Some reductions may have resulted from economic downturns, or for other reasons. Inevitably, there is a shakedown period at the start of something as ambitious as the Toxic Release Inventory during which baseline measures are established.

The impact of TRI has far exceeded our expectations as a tool for improving environmental management. This is a great tribute to the vision of its Congressional sponsors. Experience to date demonstrates the important role that the public and communities generally can play in achieving environmental goals. Public involvement has been instrumental in raising the awareness of manufacturing facilities about the toxic chemicals they release into the environment. Many companies have begun to focus attention on reducing emissions. Some in industry have found that TRI data can serve as a diagnostic tool to help them identify and address sources of pollution.

EPA will use all means at our disposal to make pollution prevention the watchword. We must involve all our partners in environmental protection–government, business, the environmental community. I will be working with my colleagues in other Federal agencies and in the States. Industry must vigorously pursue pollution prevention; individual companies are often the best source of knowledge and ideas about pollution prevention opportunities in their facilities.

The surest path to protecting human health and the environment lies in our ability to achieve a steadily decreasing volume of and steadily decreasing exposure to hazardous substances in the environment. We know from experience that pollution prevention works: it can save money, it can protect health, it can protect the environment. It requires laws and policies that unleash American ingenuity to solve problems in new ways. It requires that we think more carefully about the consequences of our actions. And it requires creativity and commitment from all of us.

I am profoundly conscious of the many unmet environmental needs this country faces, and of the unprecedented needs and expectations of the American people. EPA cannot meet these needs and expectations alone. I invite each of you to join us, to use the TRI data as effectively as you possibly can.

William K. Reilly

William K. Reilly

Administrator, U.S. Environmental Protection Agency

PREFACE

Even as we put the finishing touches on this report covering the 1988 data from the Toxics Release Inventory, the data for 1989 is already being processed at EPA's reporting center. Both industry and the Agency have become more conversant with the ins and outs of the entire TRI system and our experience with the first year of reporting—in which we lunged from crisis to crisis—has smoothed out considerably. The Toxics Release Inventory, once described as a revolution, is becoming something of an institution.

This National Report is part of that institution, and is one of the major means by which EPA makes available to the public the information in TRI. We have expanded the scope of the report this year, adding information on health effects of TRI chemicals, focusing more analysis on individual facilities, and incorporating data from sources other than TRI. In addition, this is the first opportunity to compare data from year to year, an analysis that presented unexpected complexities. It is our hope that these changes further illuminate the broadening utility of the Toxics Release Inventory. As always, we would be eager to have your suggestions as to how the report can be made even more useful in the future.

DAVID SAROKIN
National Report Project Manager

PART I

Introduction and Review

Photo: Daniel J. Kasztel

EXECUTIVE SUMMARY: TOXICS IN THE COMMUNITY

OVERALL INCREASES AND DECREASES

In the second year of reporting for the Toxics Release Inventory (TRI), 19,762 manufacturing facilities reported 6.2 billion pounds of environmental releases and off-site transfers of chemical wastes for 1988. Three quarters of this amount (4.5 billion pounds) was released directly into the air, water, land, or underground wells; the other 1.7 billion pounds was transferred off-site from the originating facilities to waste management facilities such as public sewage treatment plants, incinerators or landfills.

TRI releases and transfers in 1988 totalled 6.2 Billion pounds.

While more facilities submitted more forms to TRI, total releases and transfers decreased 11 percent from 1987 to 1988 (from seven billion to 6.2 billion pounds). In fact, *all* types of releases and transfers decreased from 1987 to 1988. Over one third (2.4 billion pounds) of the TRI total was emitted to air. This is a decrease of 148.4 million pounds from 1987. Surface water discharges dropped from 403.1 million pounds to 361.6 million pounds from 1987 to 1988. On-site land disposal dropped 23 percent between 1987 and 1988, from 730.9 to 561.6 million pounds. Underground injection amounts dropped six percent (from 1.3 to 1.2 billion pounds). Transfers to public sewage treatment plants dropped from 614.8 to 570.6 million pounds. Levels of off-site transfers dropped from 1.4 to 1.1 billion pounds.

Total releases and transfers decreased from 1987. . .

While some of the decrease in TRI totals is due to actual reductions in the quantity of wastes generated or disposed of, much of the apparent decline between 1987 and 1988 stems from "paper" changes, that is, from changes in how wastes were estimated or reported, rather than changes in waste generation practices. For instance, some recycled materials that were inadvertently reported in 1987 (recycled material is generally not subject to TRI reporting requirements) were not reported for 1988. For the facilities reporting the 10 largest decreases, at least 66 percent of the reduction is due to paper changes in the data.

. . . but much of the decrease is due to "paper" changes.

Ten percent of TRI facilities filled out the optional waste minimization question on the form, including eight out of the top 50 largest volume facilities. California and New Jersey had the largest number of responders. Facilities reporting pollution prevention averaged a 22 percent (absolute) reduction in waste quantities from 1987 to 1988. This reduction increased to 33 percent when production indexes are factored in.

Some reductions were brought about through pollution prevention.

TRI totals increased for 106 chemicals.

Increases were reported for 106 chemicals (out of 253 that were reported in both 1987 and 1988). Manganese compounds and chlorine increased by 50 million and 27 million pounds respectively.

TRI totals increased in some heavily industrialized areas. For instance, releases and transfers in Kanawha Valley, West Virginia, increased from 17 to 23 million pounds. Much of the increase was from a Du Pont plant in Belle, West Virginia.

HEALTH AND ENVIRONMENTAL EFFECTS OF TRI CHEMICALS

7 of the top 25 chemicals are highly toxic.

Seven of the 25 chemicals with the largest TRI totals are considered highly toxic. Four of these are toxic to humans or terrestrial animals on one or more of the indices used to rank toxicity, and six are considered highly toxic to fish and other aquatic organisms. On the other hand, four of the top 25 chemicals have not been ranked for toxic health or environmental effects. The absence of a toxicity rating does not necessarily indicate, however, that the chemical is not of concern. The chemical may cause indirect effects or pose hazards not measured by these indices.

Carcinogens accounted for 8% of the TRI total.

Releases and transfers of the 123 carcinogens on the TRI list constituted eight percent of the TRI total releases and transfers for both 1987 and 1988 (with 562.8 and 464.4 million pounds, respectively). Dichloromethane was the carcinogen released and transferred in the greatest amounts. Of the top 25 carcinogens, lead and dichloromethane had the largest decreases in releases and transfers from 1987 to 1987 with decreases of 25 million and 21 million pounds, respectively. This represents a 53 percent decrease for lead and a 14 percent decrease in the case of dichloromethane.

Approximately 60 percent of the total amount of the top 25 carcinogens was emitted to air, and another 24 percent was transferred off-site to treatment, storage, and disposal facilities.

Altogether, facilities in 25 counties in 12 states generated almost one third of the TRI carcinogen total for the nation. Dichloromethane was among the top ten chemicals in California, Michigan, Florida and Indiana.

In keeping with the overall industrial distribution of total releases and transfers, the Chemical industry was responsible for the largest amount of TRI carcinogen releases and transfers. The carcinogens released in greatest amounts were the most widely distributed among industries: no single industry contributed more than half of any of the top four carcinogens.

TRI totals for ozone depleting chemicals were 254 million pounds.

Of the 322 chemicals on the TRI list, three are considered ozone depleters: 1,1,1-trichloroethane, Freon 113, and carbon tetrachloride. These chemicals destroy the ozone molecules in the earth's protective ozone layer which lies between 10 and 20 miles above the earth's surface and may thus indirectly cause human health effects such as increased cases of skin cancer

Releases and transfers of ozone depleters totalled 254.0 million pounds. The ozone depleter with the largest total was 1,1,1-trichloroethane with 180.4 million pounds or 71 percent of the total for ozone depleters. Freon 113 was the second largest with 68.5 million pounds (27 percent) and carbon tetrachloride was released the least with 5.1 million pounds (two percent). The total releases and transfers of ozone depleters only decreased by two percent (6.1 million pounds) in 1988.

The majority of releases (90 percent) of ozone depleters are emitted to air with a smaller percentage transferred off-site (ten percent). California ranked first in releases and transfers of ozone depleters. The Transportation Equipment industry and the Electric and Electronic Equipment industry rank first and second, respectively, for releases and transfers of ozone depleters.

THE IMPACT OF INDIVIDUAL STATES, LOCALITIES, AND FACILITIES

Louisiana and Texas had the nation's largest TRI totals.

Louisiana facilities reported the largest total releases and transfers of TRI chemicals (741.2 million pounds or 12 percent of the national total). Texas facilities were a close second, with 724.5 million pounds. In general, facilities in the Gulf Coast, Great Lakes, and mid-Atlantic states, as well as California, had the largest TRI releases and transfers, while smaller amounts were generated in the Rocky Mountain and Great Plains regions. Ten states had totals greater than 200 million pounds and accounted for over half (3.5 billion pounds) of TRI total releases and transfers in 1988.

TRI state totals were often concentrated in one or several counties. Five Texas counties were among the top 25, and accounted for 73 percent of total releases and transfers in Texas. Louisiana had four counties in the top 25; releases and transfers from the four accounted for 85 percent of the state's total. Together, Texas and Louisiana had seven of the top ten counties and nine of the top 25. In most cases, only a handful of individual facilities accounted for the majority of the releases and transfers within the top-ranked counties. For example, two Texas facilities operated by Du Pont and Monsanto accounted for 30 percent of all releases and transfers in Texas and two facilities in Utah, Kennecott Utah Copper and Amax Magnesium, reported 94 percent of the TRI total for the state.

Top-ranked cities, like top-ranked counties, often owe their large TRI totals to only a few individual facilities. Westwego and Norco—both in Louisiana—led nation's cities for total TRI amounts. American Cyanamid (a chemical facility in Westwego) and Shell Oil (a diversified facility in Norco) *each* reported larger TRI totals than did most states.

50 (out of 20,000) facilities accounted for 1/3 of the TRI total.

Just 50 individual facilities were responsible for over one third of all TRI releases and transfers. Five facilities reported amounts of over 100 million pounds each, and 11 more reported more than 50 million pounds each. All but 15 of the top 50 facilities were chemical facilities. Although these represented less than one percent of all chemical facilities, they contributed 56 percent of the Chemical industry's TRI releases and transfers, and slightly over one quarter of the national TRI total. The Primary Metals industry filled nine of the remaining 15 slots on the list of top 50 facilities. Those facilities were less than one percent of all Primary Metals facilities, but accounted for 38 percent of that industry's TRI releases and transfers and five percent of the national TRI total.

DATA QUALITY AND COMPLETENESS

The number of TRI forms increased in 1988.

More facilities submitted more forms to TRI in 1988 than in 1987. The number of facilities that reported to TRI increased five percent, while the number of forms submitted increased seven percent. This difference stems in part from the fact that reporting thresholds decreased from 75,000 to 50,000 pounds of chemical manufacture, so facilities which fell under the cut-off in 1987 may have been over the cut-off in 1988.

EPA site audits found aggregated TRI data to be highly accurate . . .

All told, the TRI data were found to be surprisingly accurate *in the aggregate*. The total volume of reported TRI releases and transfers was just two percent lower than the corrected figures arrived at by EPA's site visit teams. National totals for air releases, water discharges, and other environmental media are generally within plus or minus ten percent of the corrected data estimates. Almost 80 percent of all release estimates were found to be without an error.

. . . but only 2 out of 3 facilities reported to TRI as required.

An EPA survey estimated that only two out of every three companies in the nation that should have reported actually did so; an additional 10,000 facilities should have reported to TRI. Compliance rate varied with industries. The Chemical industry had the highest overall compliance rate of 88 percent—almost nine out of ten chemical manufacturers that should have reported to TRI actually did so. On the other hand, the Apparel industry and the Printing and Publishing industry had unusually low compliance rates. These compliance figures are for 1987. Compliance for 1988 reporting has not yet been evaluated. Improved compliance is a high priority for the TRI program.

TRI captures only a portion of total toxic releases.

TRI reporting does not include all sources of releases and transfers of toxic chemicals. Manufacturing facilities are exempt from reporting if they do not meet threshold requirements, or if they have fewer than 10 employees. Non-manufacturing operations are currently exempt from reporting. For some chemicals used exclusively in manufacturing operations, TRI may capture most of the releases for that chemical. For others, TRI captures only a fraction of the total.

For example, TRI data for releases and transfers of 1,3-butadiene account for only 15 percent of total releases of this chemical; the remainder comes primarily from automobile emissions. For chloroform, TRI captures an estimated 66 percent of total releases, but significant quantities are also generated in non-manufacturing settings such as drinking water chlorination plants.

INDUSTRIAL DISTRIBUTION OF TRI RELEASES AND TRANSFERS

The Chemical industry accounted for almost half of all TRI releases and transfers.

The Chemical industry dominated total releases and transfers nationwide, accounting for almost half (46 percent) of the 1988 total reported to TRI for 1988. This industry was the source of 63 percent of all TRI discharges to surface water and 80 percent of underground injection. Three chemical companies, with more than 100 reporting facilities between them, accounted for more than 700 million pounds of TRI releases and transfers. The three are Du Pont (319 million pounds, 74 facilities), Monsanto (202 million pounds, 37 facilities) and American Cyanamid (189 million pounds, 27 facilities).

Facilities in all but four industries emitted the largest share of their TRI totals to air. Furniture manufacturers emitted 91 percent of their TRI total to air; Primary Metals facilities used on-site land disposal and off-site transfers for almost two thirds of their total. Three industries—Primary Metals, the Chemical industry, and Diversified facilities—accounted for 93 percent of all on-site land disposal.

TRI releases and transfers from the Chemical and Petroleum industries were concentrated in Louisiana and Texas. North Carolina had large releases and transfers from its Furniture and Textiles industries. Fifteen percent of the nationwide TRI total for the Primary Metals industry came from Utah. Petroleum industry releases were concentrated in just three states, while Transportation industry releases topped one million pounds in each of 34 states. A single Eastman Kodak plant in Rochester, New York generated one third of the total for the Measuring/Photographic industry.

Some of the chemicals with the largest TRI totals were released in significant amounts by facilities in many industries, without one industry dominating. Three particularly widespread chemicals were sulfuric acid, toluene, and acetone. TRI totals for every industry contained at least 100,000 pounds of each.

ENVIRONMENTAL DISTRIBUTION

Air emissions were the largest segment of the TRI total.

Of the 6.2 billion pounds of TRI releases and transfers, 39 percent (2.4 billion pounds) were air emissions. Underground injection and off-site transfers accounted for another 19 percent and 18 percent respectively.

Air emissions in Texas decreased from 1987 to 1988, while air emissions in Utah increased. Other than Texas and Utah, air emissions in the top-ranked states remained relatively constant. Discharges of TRI chemicals to surface water were three times greater in Louisiana than those in any other state and were concentrated in a single parish (county). Florida facilities led the nation in the total quantity of on-site land disposal, with 82.6 million pounds, or 15 percent of the national total. Together, Texas and Louisiana accounted for 67 percent of all underground injection in the U.S. Missouri discharged the most TRI wastes to public sewage treatment plants. The largest share of TRI off-site transfers originated in Ohio.

The environmental distribution of TRI releases and transfers varied considerably by industry. Facilities in all but two industries released a greater total amount of chemicals directly into the air, water, land, or underground wells than they transferred off-site to other facilities. Only the Leather and Leather Products industry and the Food Products industry reported a majority of their TRI amounts as transfers (rather than releases).

CHEMICAL DISTRIBUTION OF TRI RELEASES AND TRANSFERS

Ammonium sulfate, hydrochloric acid and methanol accounted for 30% of the TRI total.

Twenty-five chemicals constituted 83 percent of all TRI releases and transfers in 1988. Ammonium sulfate, hydrochloric acid and methanol made up 30 percent of all releases and transfers. The chemicals released and transferred in the largest amounts were not always those reported by the most facilities. For example, toluene was the second most frequently reported chemical (listed on 3,553 forms), but ranked fifth for total releases and transfers with 333 million pounds. Ammonium sulfate, on the other hand, was released and transferred in larger amounts than any other TRI chemical, yet ranked 42nd for the number of TRI forms reporting releases and transfers (only 301 TRI forms).

TRI totals for phosphoric acid and sulfuric acid decreased 99 million pounds (29 percent) and 92 million pounds (19 percent), respectively—more than the decreases for any other chemicals. Manganese compounds increased the most (in absolute number of pounds), doubling to 114.9 million pounds. Manufacturers reported small or no releases and transfers for one quarter of all TRI chemicals.

COMPARING 1987 AND 1988 TRI TOTALS: MATCHED DATA

In order to factor out the impact of new facilities reporting to TRI for the first time in 1988, and reports of new chemicals, EPA created subsets of the TRI data for detailed comparisons of 1987 and 1988 releases. *Matched facilities* are those that reported to TRI in both 1987 and 1988. *Matched chemicals* are those reported in both 1987 and 1988 by matched facilities. The percentage of matched facilities in each state ranged from 75 to 85 percent. Seventy-seven percent of the facilities that reported to TRI in 1988 also reported in 1987. TRI facilities that reported both years generated 96 percent of the total releases and transfers (by weight) in each year.

Matched Chemicals

Copper and sulfuric acid were the matched chemicals that decreased the most. Copper decreased 133.2 million pounds (83 percent) and sulfuric acid decreased 102.8 million pounds (22 percent). Matched facilities increased their discharges of manganese compounds and chlorine by the largest amounts (50.1 million pounds or 94 percent and 27.3 million pounds or 23 percent, respectively).

The industries with the largest decreases were the Chemical and Primary Metals industries with decreases of 425.1 million pounds (13 percent) and 146.1 million pounds (17 percent), respectively. The two industries exhibiting increases were the Tobacco and Food industries with increases of 8.2 million pounds (123 percent) and 481,000 pounds (one percent), respectively.

Air emissions of matched chemicals decreased eight percent from 1987 to 1988. Air emissions of ammonia and methyl ethyl ketone decreased the most. Air emissions of chlorine, methanol, nitric acid, Freon 113, and phenol each increased by more than one million pounds.

Air emissions of matched chemicals decreased 8%.

Matched air emissions of carcinogens decreased by nine percent. Dichloromethane decreased the most, by seven million pounds (six percent). Few carcinogens increased in sizable amounts from 1987 to 1988. Only 1,4-dichlorobenzene increased by more than 500,000 pounds (55 percent) in 1988.

Facilities in the Chemical industry reduced air emissions more than any other industry—132.0 million pounds (15 percent). The Primary Metals industry increased emissions the most (25.8 million pounds, 14 percent).

Discharges to surface water decreased 42.0 million pounds (11 percent). Of the 210 matched chemicals discharged to surface water, discharge amounts increases for 80 TRI chemicals, decreased for 124, and stayed the same for six. Discharges

Discharges to surface water decreased 11%.

of each of ten chemicals decreased by more than one million pounds. Arsenic compounds decreased the most, by 10.4 million pounds—nearly 100 percent.

Discharges of 65 out of a total of 144 matched carcinogens and/or water priority pollutants decreased, while 37 increased, and four stayed the same. Three carcinogens—formaldehyde, chloroform, and benzene—each decreased by more than 100,000 pounds. Formaldehyde decreased by 20 percent (215,000 pounds). Chloroform decreased by 14 percent (161,000 pounds). Benzene decreased by 77 percent (53,000 pounds).

The Chemical industry, which had the largest surface water discharges of matched chemicals for 1988, was principally responsible for the net decrease of 58.1 million pounds. Chemical industry discharges dropped 53.3 million pounds (21 percent)—more than twice as much as the combined increases of all industries that increased their discharges.

Land disposal of matched chemicals decreased 29%.

Matched facilities reported a net decrease of 188.1 million pounds (29 percent) of land disposal of matched chemicals. Only the decrease in off-site transfers exceeded that for land disposal. Land disposal of copper dropped by 125.5 million pounds. Phosphoric acid disposal dropped 88.5 million pounds (48 percent), the second largest decrease. Land disposal of manganese compounds more than doubled, increasing by 47.2 million pounds (156 percent). Land disposal of ammonium sulfate increased 6.8 million pounds (96 percent), the second largest increase of any chemical.

Land disposal of carcinogens increased five percent overall (from 14.0 to 14.6 million pounds). Approximately half the net increase in carcinogens consisted of chromium, whose land disposal increased 3.1 million pounds (131 percent), more than any other carcinogen.

Underground injection of matched chemicals decreased 7%.

Underground injection of matched chemicals decreased by seven percent (90.2 million pounds) from 1987 to 1988. Underground injection of hydrochloric acid dropped 17.2 million pounds (14 percent). Underground injection of carcinogens increased by 3.8 million pounds (12 percent).

Louisana's state total for underground injection dropped 61.4 million pounds (13 percent). Texas facilities cut their underground injection by 37.2 million pounds (nine percent). In contrast, Kansas facilities increased matched underground injections 24.7 million pounds (38 percent). The Chemical industry reported the largest decrease in underground injection, 45.9 million pounds (six percent).

Transfers to public sewage treatment plants of matched chemicals decreased 10%.

Transfers of matched chemicals to public sewage treatment plants decreased 59.1 million pounds (ten percent) from 1987 to 1988. Transfers of sulfuric acid, hydrochloric acid, and ammonia each decreased over ten million pounds, together accounting for 91 percent (53.5 million pounds) of the decreases in transfers to public sewage systems. The greatest increase was 2.0 million pounds for n-butyl alcohol (79 percent). The Chemical industry reported the largest amount of matched transfers to public sewage treatment plants amounting to 313.9 million pounds (61 percent). Missouri, the state with the largest total matched sewage transfers, also reported the greatest increase (6.9 million pounds, a ten percent increase).

One-hundred-and-eight of the chemicals discharged to public sewage plants in 1988 were either water priority pollutants or carcinogens. The net decrease for these 108 chemicals was only one-half of one percent. Of the 40 carcinogens and water priority pollutants reporting the largest matched sewage transfers in 1988, 23 showed increases.

Off-site transfers of matched chemicals decreased 22%.

Off-site transfers decreased 255.8 million pounds (22 percent), a larger volume decrease than any other type of release or transfer. Off-site transfers of sulfuric acid decreased by 66.4 million pounds (40 percent) more. Transfers of hydrochloric acid rose 29.3 million pounds (28 percent). Ethylene glycol and aluminum (fume or dust) both increased by approximately ten million pounds.

In 1988, off-site transfers of carcinogens dropped 51.3 million pounds (35 percent) and accounted for ten percent of total off-site transfers. Off-site transfers of most carcinogens dropped, with styrene and lead decreasing the most (18.6 million pounds, 70 percent and 10.8 million pounds, 52 percent, respectively). Off-site transfers of only 21 carcinogens increased in 1988.

OTHER ANALYSES

In addition to the analyses of national patterns of TRI data, more specific analyses can be carried out to illuminate details of regional, industrial or chemical releases and transfers.

Waste Treatment

Many TRI chemical wastes are treated on-site before they are released to the environment or receive treatment after being transferred off-site. Waste treatment practices have been divided in TRI into seven major categories: treatment of air emissions, biological treatment, chemical treatment, incineration or thermal treatment, physical treatment, recovery or reuse, and solidification or stabilization.

Half of all TRI facilities treat their chemical wastes on-site. Nearly 50 percent of facilities also reported transferring some or all of their wastes containing TRI chemicals to off-site waste management facilities (other than public sewage plants) that treated, stored, or disposed of the wastes.

The largest portion (515.5 million pounds, 47 percent) of off-site transfers of TRI chemical wastes in 1988 went to some type of treatment facility. The second largest portion (378.5 million pounds, 34 percent) went to facilities that disposed of the chemicals on land or through underground injection. Another 12 percent (128.1 million pounds) of off-site transfers went to facilities where the treatment was not specifically identified.

Volatile Organic Chemicals in Louisiana

TRI data can also be used for regional analysis. Eight Louisiana counties (known as parishes) contain 81 TRI facilities, almost a third of all the facilities in the state. These facilities released volatile organic chemicals (VOCs) known to contribute to ozone formation, a major component of smog. In 1988, these facilities submitted 606 TRI forms for VOCs, or more than seven forms per facility (as compared to a national average of only four per facility for all chemicals).

The eight counties released 28.6 million pounds of VOCs to the atmosphere in 1988, 53 percent of total VOC air releases in the state (54.4 million pounds), and 17 percent of national VOC air releases (1.7 billion pounds). Ten facilities in six counties had VOC air emissions of over a million pounds each, accounting for 62 percent of the total from the 81 facilities. More than 40.3 million pounds of VOCs were disposed of by underground injection in 1988.

Kanawha Valley, West Virginia

Another analysis was done on 16 facilities in the heavily industrialized Kanawha Valley region of West Virginia. These facilities (13 are chemical plants) reported releases and transfers of 23.0 million pounds (40 percent of all TRI releases and transfers reported in West Virginia). Overall TRI releases and transfers in the Kanawha Valley increased. The 7.1 million increase of ethylene glycol at the Du Pont plant in Belle, West Virginia offset any decreases.

Air emissions made up 47 percent of the TRI totals in the Kanawha Valley in 1988. Off-site transfers increased from 630,000 pounds in 1987 to 7.4 million pounds in 1988 (due to the Du Pont plant mentioned above). The number of carcinogens released or transferred in Kanawha Valley dropped from 13 in 1987 to 12 in 1988 and decreased by 51 percent. Two chemicals largely responsible for this drop were dichloromethane for which emissions dropped by more than half, and styrene, for which 1988 emissions were only three percent of those in 1987 (514,000 pounds in 1987 to 2,000 pounds in 1988).

Santa Clara County, California

A final analysis was completed on the highly-populated Santa Clara County, California. The 154 TRI facilities in this county reported releases and transfers of 8.4 million pounds of TRI chemicals. Of this, 61 percent were released to the air. The remainder was transferred to public sewage treatment plants or off-site.

Fifty percent of the air emissions reported by facilities in Santa Clara County were of chemicals that are considered to be of low toxicity. The facilities released 45 percent of moderately toxic chemicals to air in 1988. Five percent of highly toxic chemicals were also released to air in 1988.

The top four carcinogens listed—dichloromethane, styrene, formaldehyde, and isopropyl alcohol—account for 95 percent of carcinogen releases to air. Facilities in Santa Clara County released 34,781 pounds of other highly toxic, but non-carcinogenic, chemicals to air in 1988.

Risk Screening

TRI data can be combined with information on population, meteorology, hydrology and so on to provide an initial analysis known as a "risk screening", which is used to identify those TRI releases that may pose a significant risk to human health or the environment. The TRI data for a small community with three facilites provides an example of this type of analysis.

Photo: Daniel J. Kasztel

CHAPTER 1. THE TOXICS RELEASE INVENTORY: AN INTRODUCTION

The Toxics Release Inventory (TRI), the first national database of information on toxic pollution by manufacturing industries, has had far-reaching effects since the U.S. Environmental Protection Agency (EPA) released the first year of TRI data in June of 1989. TRI has evoked enthusiastic interest and attention in every sector of public life—in Congress and in Federal and State government agencies, from the press, from public interest groups, from industry, and from the public itself. TRI is, literally, changing the way America does business. Below are a few of the responses, randomly selected from among hundreds:

- Congress used TRI data when debating whether to enact new legislation regulating air toxics;
- EPA has analyzed TRI data to determine which toxic chemicals ought to be reviewed or regulated more strictly under such laws as the Toxic Substances Control Act;
- the State of New Jersey has relied on TRI data to set priorities for which industries will be compelled to participate in the State's new pollution prevention initiative;
- *USA Today* carried out an independent analysis of what TRI reveals about national patterns of toxic pollutants, featuring the story for three consecutive days;
- the National Wildlife Federation used TRI to compile and publish a list of the nation's Toxic 500—the 500 companies reporting the largest releases of toxic chemicals;
- the Monsanto Corporation pledged to cut its toxic air releases by 90 percent—to 10 percent of its 1987 TRI levels—by 1992; and
- requests for information from the National Library of Medicine's TOXNET system, where the TRI database is stored and through which the public can gain access, have reached unprecedented levels.

Moreover, the data have contributed to scores of actions at communities across the nation, where citizens newly armed with detailed information have been able to ask operators of industrial plants the simple question: *Is all this toxic pollution really necessary?*

What is TRI that it has prompted such a widespread response? The remainder of this chapter answers the first part of the question, explaining TRI, the data it contains, its limitations, and how it has been changed since its inception. The report as a whole addresses the second part of the question, presenting a national summary of TRI data on the patterns of industrial toxic pollution—the overall geographical, industrial, and environmental distribution, as well as the specific chemical composition. These national statistics paint a backdrop for the nation, a standard of comparison against which more detailed analyses can be made. The true distinction of TRI is that it offers detailed information at the community level. TRI beckons to all interested citizens, charging them to conduct analyses that will reveal the details of the toxic pollution in their communities.

THE LAW

The Toxics Release Inventory (TRI) was mandated by the "Emergency Planning and Community Right-to-Know Act" (EPCRA) passed by Congress in October of 1986. The law, also known as Title III of the Superfund Amendments, is based on the premise that citizens have a "right-to-know" about the routine storage, use, and emissions of toxic chemicals, and has two main purposes: to provide the public and the government information about possible chemical hazards in their communities; and to provide for planning for response to chemical accidents. Section 313 of EPCRA requires manufacturers to report to the U.S. Environmental Protection Agency (EPA) and to states the amounts of over 300 toxic chemicals that they release directly to air, water, or land, or that they transferred to off-site facilities that treat or dispose of wastes. In addition, the law specifies that EPA must compile these reports into an annual inventory of releases and transfers—the Toxics Release Inventory—and make the inventory available to the public in a computerized database.

Other sections of EPCRA require that a broad spectrum of facilities, not just manufacturers, report about the presence, accidental release, and storage of hazardous chemicals to state and local entities. The law calls for each State to establish a State Emergency Response Commission, and within the State, Local Emergency Planning Committees (LEPCs), to receive information now required to be reported about the presence and accidental releases of certain extremely hazardous substances in the community. Further information about storage and inventories of more broadly defined hazardous chemicals is also collected. These LEPCs are to use the information from all parts of the law to plan for response to a chemical accident at the local level, and to examine the patterns of risk from chemical hazards in the community and work to reduce that risk. The LEPCs are to make the information reported locally available to the public.

WHO MUST REPORT TO TRI?

TRI requirements for 1988 covered all *manufacturing facilities* in the 50 states, the District of Columbia, Puerto Rico, American Samoa, the Northern Mariana Islands, and the U.S. Virgin Islands that met all of the following conditions:

- they produced, imported, or processed 50,000 pounds or more of any of the 322 TRI chemicals *or* they used in any other manner 10,000 pounds or more of a TRI chemical;

- they were engaged in general manufacturing activities; and
- they employed the equivalent of ten or more full-time employees.

WHICH TOXIC CHEMICALS WERE REPORTED FOR 1988?

The 1988 TRI reporting requirements covered 302 individual toxic chemicals and 20 categories of chemical compounds. A complete list of these chemicals and categories is contained in Appendix B.

The TRI chemicals vary widely in the frequency, amounts, and industrial processes in which they are used. The list runs from familiar chemicals, such as ammonia, benzene and copper, to more obscure chemicals, such as 4-dimethylaminoazobenzene. TRI chemicals are manufactured not only as products, but are also incorporated into a wide variety of other products such as solvents, disinfectants, dyes, and catalysts, to name a few.

The chemicals also cover a gamut of toxicity, ranging from acutely lethal chemicals to those that are not very toxic and are therefore subject to removal from the TRI list as a part of EPA's ongoing review process (see Chapter 4, Boxes 4-C and 4-E). A few chemicals, such as copper, while essential to life in small quantities, can be toxic in larger amounts.

WHAT CONSTITUTES A TRI RELEASE?

TRI calls for facilities to report the amounts of the listed toxic chemicals that are released directly to air, water, or land. In addition, manufacturers must report amounts of chemicals that are transported (transferred) off-site to facilities, including public sewage treatment plants, that treat or dispose of the chemical wastes. Releases and transfers include the following:

- emissions of gases or particles to the air;
- wastewater discharges into rivers, streams or other bodies of water;
- disposal of wastes in on-site landfills;
- injection of liquid wastes into underground wells;
- transfers of wastewater to public sewage treatment plants; and
- transfers of wastes to off-site facilities for treatment, storage or disposal.

Both routine releases and accidental spills or leaks must be reported. Facilities must report even if their releases comply with all environmental laws and permits. Many of the chemicals are regulated for some types of releases and not others so that TRI data is not necessarily an indication of regulatory violations.

WHAT TO REPORT?

EPA required that manufacturers submit a complete TRI data form (EPA Form R) for *each* TRI chemical they manufactured or used in 1988 if they met the threshold and other requirements established for TRI. In other words, a facility that must report on four TRI chemicals must submit four separate forms. TRI information is reported on a five-page form, a sample of which is reproduced in Appendix A. The basic information required by the form falls into six categories.

- **Facility Information**. In addition to facility name and address, TRI requires reporting of the following: a technical and public contact person, geographical data (latitude, longitude and county name), and various business and regulatory identifying numbers. Information on the facility's parent company is also required.
- **Off-Site Transfer Information.** The names, addresses and other identifying information for all sites to which the reporting facility transports TRI chemical wastes.
- **Chemical Use Information.** The identity of the TRI chemical being reported, along with information on the uses of the chemical at the facility and the maximum quantity present on-site during the reporting year.
- **Chemical Releases and Transfers**. Annual quantities of TRI chemicals released to air, water, or land and quantities transferred to off-site facilities.
- **Waste Treatment**. TRI also calls for data on the types of on-site methods used to treat TRI chemicals and the efficiency of these methods.
- **Waste Minimization.** TRI forms include an *optional* section allowing facilities to report activities that reduced their waste generation and the effect these activities had on their TRI releases and transfers.

These are the types of data required to be reported to EPA under TRI, which form the basis for all the summary and overview information presented in this report.

EPCRA, TRI AND COMMUNITY RIGHT-TO-KNOW

The primary intent of the Emergency Planning and Community Right-to-Know Act is to provide the public with information on toxic chemicals. This report is one vehicle by which TRI data are being made available. The information may also be obtained in either printed or electronic format through other means (Box 1-A).

The National Library of Medicine (NLM) has worked with EPA to establish a publicly-accessible computer database of TRI information. The TRI data are part of NLM's TOXNET system. Users with a personal computer or a terminal and conventional communications software can call into the NLM system to obtain TRI data.

LIMITATIONS OF TOXICS RELEASE INVENTORY REPORTING

Subsequent chapters of this report show how TRI offers insights into industrial sources of environmental releases of chemicals. Like any information system, however, TRI has limitations that must be accounted for in any responsible use of the data. Major limitations include the chemicals and facilities covered, the protection for trade secrets, and the quality of the data estimated and reported.

TRI Coverage of Toxic Chemical Releases and Transfers

The set of chemicals identified for reporting under TRI was drawn from lists developed independently by the states of Maryland and New Jersey for their own reporting purposes. The chemicals vary widely in toxicity, thus in some cases, small reported releases of highly toxic chemicals may be of more environmental concern than larger releases of less toxic chemicals. Moreover, the list of chemicals currently covered does not include all toxic chemicals of concern being released by facilities into our environment. EPA has an on-going process to review the TRI list of chemicals and add new chemicals of concern, or delete chemicals that are no longer of concern.

Toxic chemical wastes are generated from many different sources, including manufacturing and non-manufacturing industrial processes, use and disposal of consumer products, agricultural uses of chemicals, and mobile sources such as automobiles. TRI reporting requirements only cover manufacturing industries. Other businesses, such as warehouses, photographic processing plants, dry cleaners, and mining operations, may be substantial sources of chemical releases and transfers, but are not included under TRI reporting requirements.

Furthermore, not all manufacturing releases of TRI chemicals are covered by the reporting requirements. Facilities with fewer than ten full-time employees, and those producing, importing, processing, or using the designated chemicals below threshold amounts are not required to report. Federal facilities, including those operated by the Department of Defense, are not legally required to report, although EPA has encouraged them to do so (see Chapter 6).

Trade Secrets

TRI allows companies to claim the chemical identity on TRI forms as trade secret if they can justify the need in advance. In these cases, facilities are required to report all TRI information under a generic chemical name. As of this writing, only 23 trade secret claims are contained in the TRI database, a tiny fraction of the more than 70,000 forms filed for 1988.

BOX 1-A.—GETTING ACCESS TO TRI DATA

The *TRI Reporting Center* is the national repository for all TRI reports submitted to EPA. The Center can accommodate limited requests for information on individual facilities. TRI reports filed for 1988 are available from the Center and from the National Library of Medicine database described below. Reports for 1989 should be available shortly after their July 1, 1990 due date. For specific requests, write the name and address of the facility of interest and send it to:

EPA TRI Reporting Center
470 L'Enfant Plaza
Suite 7103
Washington, D.C. 20022

Individual states can also provide copies of or access to TRI forms. Appendix E contains a list of state offices that can be contacted for forms or further information.

TRI data are computer accessible through the National Library of Medicine's *TOXNET* database. Detailed information on using TOXNET is contained in Appendix E.

TRI data are also available in the following formats: magnetic tape; microcomputer floppy disk for individual state data; CD—ROM (laser disk); and microfiche for both state data and the national inventory. These versions of TRI data can be purchased from The National Technical Information Service (NTIS) or the U.S. Government Printing Office (GPO). For ordering information, contact the EPCRA Hotline at 800-535-0202 (202-479-2449 in Washington D.C. and Alaska).

One or more of these versions of TRI data are also available to the public at Federal depository libraries around the country. Your local library can help you locate the nearest federal depository library.

Data Quality

TRI only requires facilities to report data that are already known or reasonably ascertainable to them. It does not require companies to measure or otherwise verify the data they submit. Thus, much of the quantitative data reported were estimated with unknown accuracy. In addition, some reporting facilities misunderstood the intent of the form or made mistakes in reporting. EPA expects data quality to improve each year as facilities gain experience in reporting.

FAILURE TO COMPLY WITH TRI REQUIREMENTS

Facilities that fail to comply with the TRI reporting requirements may be prosecuted by EPA and assessed civil penalties of up to $25,000 per day for each violation. The penalty can be much higher if a facility failed to report several TRI chemicals, because failure to report each single chemical is counted as a separate violation. EPA enforcement efforts and the estimated compliance rate are described in Chapter 3.

TRI DATA AND RISK

This report contains aggregated information on releases of toxic chemicals to the environment and transfer of these chemicals to off-site locations. This information alone does not indicate the risk these chemicals pose to human health or the environment. As mentioned above, small releases of highly toxic chemicals may pose greater risks than very large releases of less toxic materials. A determination of risk depends on the individual release conditions: type and frequency of release, extent of exposure, environmental conditions, and so on. TRI data are best used to suggest cases in which more detailed assessments of risk might be called for (see Chapter 4). Throughout this report, readers should bear in mind the highly variable nature of TRI chemicals, and the fact that large amounts of TRI releases do not necessarily translate to a large potential for toxic effects.

TRI CHANGES FROM 1987 TO 1988

EPA made two major changes that affect how TRI forms for 1988 were to be filled out. First, the TRI list of chemicals for 1988 was shorter than for 1987. EPA removed (delisted) the following six chemicals from the TRI list because the Agency determined that the chemicals were not sufficiently toxic to warrant reporting:

- sodium sulfate
- sodium hydroxide
- aluminum oxide (non-fibrous)
- melamine
- C.I. acid blue, disodium salt
- C.I. acid blue, diammonium salt

Second, the reporting threshold for manufacturing or processing a chemical was lowered. In 1987, facilities were required to report to TRI if they manufactured 75,000 pounds or more of a listed toxic chemical. In 1988, the threshold was reduced to 50,000 pounds.

In addition to these major changes, EPA also changed the instructions and format of the TRI form to clarify the reporting requirements. For example, the 1987 form asked for the facility to supply one of four codes to describe the type of on-site land disposal (landfills, land treatment, surface impoundments, or other—see Chapter 10). The 1988 form actually listed the four possible choices so that facilities could check one off. This change cut down the number of times the land disposal method was either reported incorrectly or not at all. This reduced the amount of on-site land disposal for which the specific disposal method is not known. Other similar changes include clarification of the fact that releases of acids and bases need not be reported if the chemicals were neutralized before release (see Chapter 7), and new instructions noting that amounts of chemicals transferred off-site need not be reported if they were sent to waste brokers for recycling or reuse.

These and other minor changes caused some differences in how facilities reported data in 1987 and 1988. The most significant difference, however, was produced by the deletion of the six chemicals from the TRI list. The impact of this change is explored in the next chapter.

SCOPE OF THIS REPORT

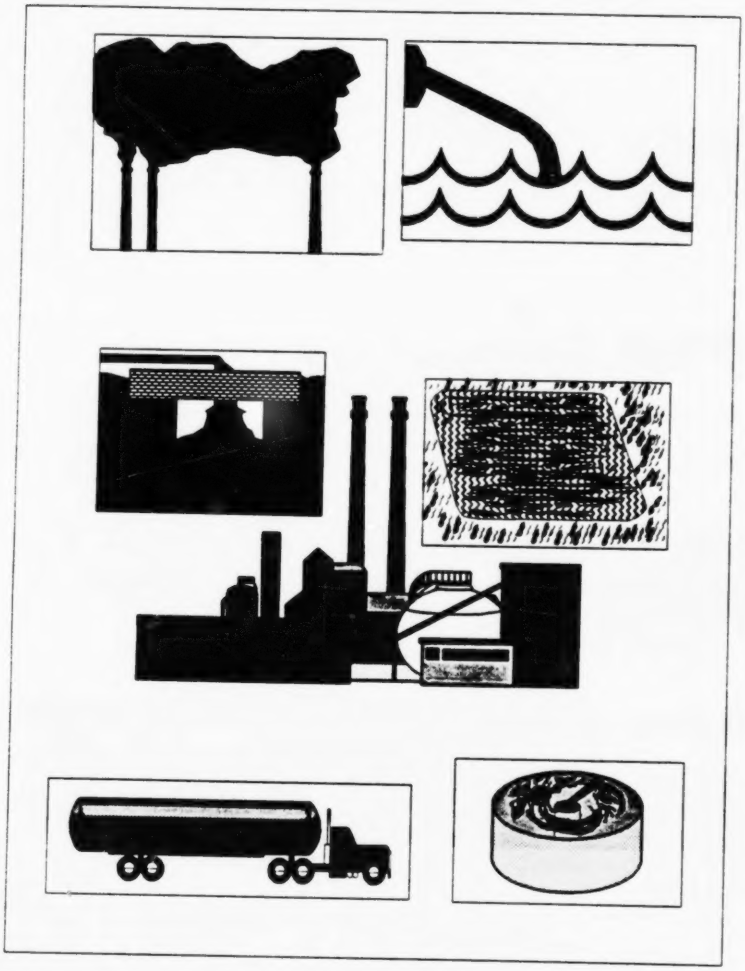
This report is divided into four major parts.

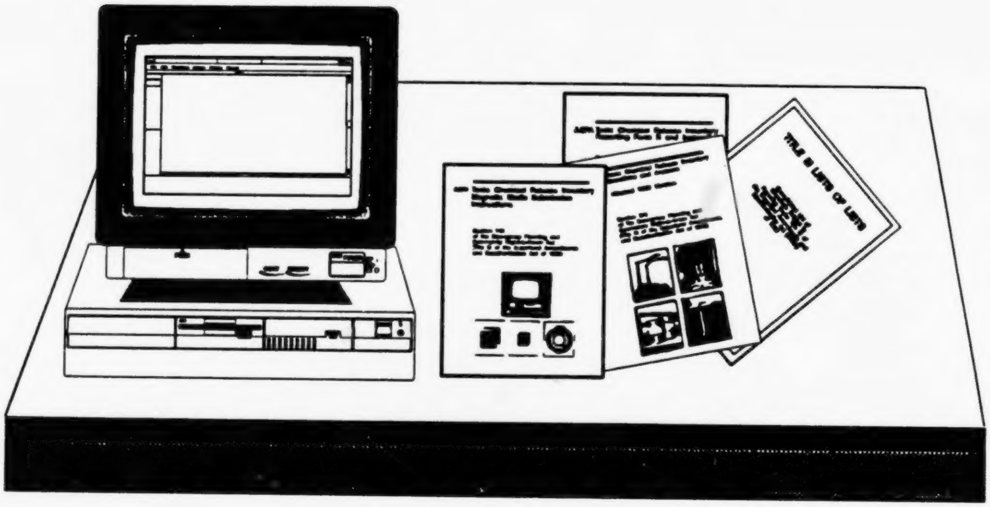
Part I includes this chapter and the next, and presents an introduction to the Toxics Release Inventory and an overview of the TRI data for 1987 (the first year of reporting). Readers who are familiar with last year's data would nevertheless benefit from a careful reading of Chapter 2, since the 1987 data have been significantly revised as a result of the removal of several chemicals from the TRI list, as well as from additions and corrections to the database.

Part II consists of Chapters 3 through 6, and is the overall presentation of the TRI data for 1988, along with general comparisons to the revised 1987 data. This section of the report gives particular attention to geographical, chemical and industrial patterns of TRI releases and transfers, and also discusses the potential health and environmental effects of TRI chemicals.

Part III, Chapters 7 through 10, presents more detailed comparisons of 1988 and 1987 data, with particular emphasis on the role of individual facilities. Analyses in this section rely on "matched" sets of data—data sets that compare releases from facilities that reported in *both* reporting years, for chemicals reported both years as well.

Part IV of the report, the final two chapters, presents a variety of other analyses of the TRI data, including information on waste treatment, pollution prevention, regional examinations of select types of releases, and additional perspectives on health and environmental effects of TRI chemicals.





TITLE III LISTS OF LISTS

CHAPTER 2. REVISION AND ADJUSTMENT OF 1987 TOXICS RELEASE INVENTORY DATA

Over 21 billion pounds of toxic releases and transfers were reported in 1987 . . .

In 1987, the first year of reporting for the Toxics Release Inventory (TRI), manufacturing facilities reported over 21 billion pounds of releases and off-site transfers of the chemicals on the TRI list. EPA described the 1987 TRI data in a June 1989 report, *The Toxics Release Inventory: A National Perspective, 1987* (1987 TRI National Report). Since then, EPA has revised the original 1987 database to incorporate revised or late reports filed by facilities and to correct database errors.

. . . but 3 chemicals discharged in large amounts have since been deleted from the TRI list.

In addition to data revisions and corrections, EPA has removed from the list (delisted) six chemicals, which dramatically changed the amounts reported for 1988. The exclusion of three chemicals—sodium sulfate, aluminum oxide, and sodium hydroxide—has particularly affected TRI totals. These three were the first-, second-, and sixth-ranked chemicals for total amount reported in 1987.[1]

Three other chemicals—melamine, C.I. acid blue (disodium salt) and C.I. acid blue (diammonium salt)—were also deleted from the TRI list. While their total releases and transfers were small and did not have any effect on the aggregate totals, they are also removed from the analyses in this chapter. This change cuts the amount of total releases and transfers in the 1987 TRI database by two thirds. Because the delisting of the three chemicals from the TRI list caused a large apparent reduction of releases and transfers from 1987 to 1988, meaningful data comparisons for the two years require an adjusted analysis of the 1987 data—that is, an analysis of those chemicals common to both years.

This chapter briefly describes the revised 1987 data, then presents an adjusted analysis of the data—one that shows how the picture for 1987 changes if the new reporting requirements are taken into account, when the chemicals removed from the TRI list for 1988 reporting are excluded from 1987 analyses. The chapter then offers a new summary of the 1987 adjusted data that will be used for comparisons to 1988 throughout the remainder of the report.

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(1) Sodium hydroxide and aluminum oxide were delisted *after* the 1988 reporting deadline, so facilities did submit forms describing their releases and transfers of each. This data has been excluded from analyses throughout this report.

REVISIONS OF 1987 TRI DATA

EPA has made 20,000 revisions to the database since March 1989.

Each TRI form entered into the database can have ten or more numerical entries and as many name and address entries; the database as a whole incorporates millions of individual data items, and is constantly being revised and corrected. The 1987 TRI National Report was based on the March 15, 1989 version of EPA's TRI database. Since then, EPA has made 20,000 revisions to the database, including the following types of changes:

- changes of one or more items on some of the 70,000+ 1987 data forms originally submitted by facilities and later revised;
- addition of data from late forms;
- corrections of data entry errors or other database problems; and
- standardization of company or county names and other such changes that did not affect the numerical totals.

EPA accepted all revisions submitted by facilities, including revised estimates of releases or transfers, as well as any forms submitted late. In addition, EPA notified facilities whose reports contained major errors or contradictions, and revised the database according to facilities' responses. EPA has also corrected database problems ranging from occasional duplicate entry of forms into the database to standardization of names or geographical information to data entry errors. As a result, the 1987 data presented in this report differs from that used in the June 1989 report.[2]

More facilities submitted more forms, but the revised 1987 TRI total actually decreased 6%.

Revised 1987 data includes 737 more facilities and 2,585 more forms. Despite increases in numbers of facilities and forms, however, revisions resulted in a net decrease of total TRI releases and transfers for 1987. The total dropped from 22.5 billion pounds to 21.3 billion pounds, a six-percent change. Total *direct releases* to air, water, and land decreased four percent, from 18.0 billion pounds to 17.2 billion pounds, while total *off-site transfers* to facilities that treat or dispose of wastes dropped 11 percent, from 4.6 billion pounds to 4.1 billion pounds. (See Table 2-1 and Figure 2-1.)

Table 2-1. Summary Comparison of Original, Revised, and Adjusted 1987 TRI Data.

	ORIGINAL 1987 DATA	REVISED 1987 DATA	ADJUSTED 1987 DATA
Number of Facilities	19,278	20,015	18,846
Number of Forms	74,152	76,737	66,757
Total TRI Releases and Transfers	22,519,044,091	21,267,366,353	6,977,432,542

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(2) This report is based on data retrieved from the April 6, 1990 version of EPA's TRI database (for both 1987 and 1988).

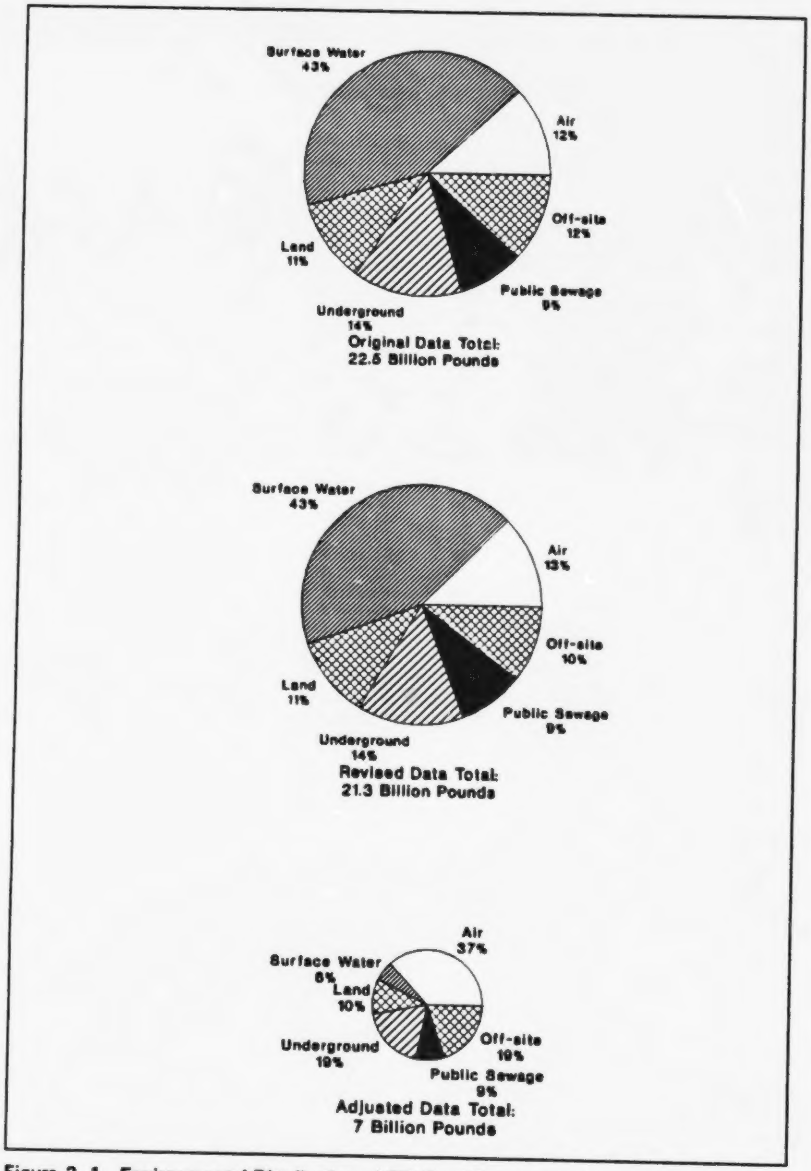

Figure 2-1. Environmental Distribution of TRI Total Releases and Transfers, 1987: Comparison of Original, Revised, and Adjusted Data.

Table 2-2. TRI Total Releases and Transfers by State: Original, Revised, and Adjusted Data, 1987.

STATE	ORIGINAL 1987 DATA		REVISED 1987 DATA		ADJUSTED 1987 DATA	
	Pounds	Rank	Pounds	Rank	Pounds	Rank
Alabama	827,064,312	4	866,618,039	4	137,371,499	19
Alaska	36,944,052	42	36,118,006	42	36,116,006	34
American Samoa	72,000	53	72,000	53	56,250	53
Arizona	126,071,984	31	79,841,444	34	73,393,460	25
Arkansas	374,781,464	18	371,686,338	15	80,819,715	24
California	5,839,808,374	1	5,787,339,367	1	227,243,845	11
Colorado	35,330,997	43	35,759,884	43	20,686,628	40
Connecticut	86,374,380	34	87,784,330	33	61,782,879	29
Delaware	58,818,708	39	62,741,340	38	16,380,748	45
District of Columbie	0	54	0	54	0	54
Florida	434,685,722	16	433,588,035	12	303,881,804	4
Georgia	661,730,868	8	696,955,156	6	144,537,387	17
Hawaii	5,063,453	49	8,039,142	47	3,251,517	47
Idaho	73,411,988	35	71,636,925	36	17,295,379	44
Illinois	468,816,984	12	453,830,077	9	266,457,734	7
Indiana	731,729,004	6	725,848,460	5	256,797,097	8
Iowa	71,583,169	36	73,385,728	35	53,410,874	31
Kansas	183,390,807	27	184,282,677	26	134,864,113	20
Kentucky	250,942,142	22	250,587,489	23	120,587,051	21
Louisiana	1,725,933,233	3	1,717,394,594	3	844,168,455	2
Maine	219,560,564	24	222,169,070	24	20,014,629	41
Maryland	195,248,259	25	195,521,605	25	43,296,676	32
Massachusetts	104,826,800	33	114,749,148	32	72,617,029	26
Michigan	742,716,029	5	376,944,397	14	268,882,394	6
Minnesota	141,498,325	29	168,313,365	29	63,726,041	28
Mississippi	656,085,795	9	285,965,564	21	164,281,523	16
Missouri	292,426,658	21	286,037,115	20	194,188,617	14
Montana	38,437,649	41	39,311,772	41	34,470,134	36
Nebraska	21,149,589	46	21,655,269	46	19,464,420	42
Nevada	11,735,250	47	5,526,066	49	2,288,293	50
New Hampshire	65,131,279	37	66,405,974	37	19,145,059	43
New Jersey	308,585,011	20	313,052,815	19	172,675,162	15
New Mexico	22,528,013	45	22,590,475	45	21,775,058	39
New York	326,074,780	19	318,720,115	18	194,344,217	13
North Carolina	441,345,879	14	444,238,684	11	138,049,052	18
North Dakota	2,803,582	52	3,590,612	52	1,072,921	52
Ohio	723,893,016	7	659,839,164	7	411,114,056	3
Oklahoma	129,781,423	30	133,185,625	30	56,767,725	30
Oregon	120,604,568	32	121,592,089	31	36,115,002	35
Pennsylvania	437,634,494	15	332,526,932	17	228,145,364	10
Puerto Rico	42,927,540	40	42,963,369	40	23,742,284	38
Rhode Island	26,622,622	44	27,684,339	44	13,692,203	46
South Carolina	518,127,600	11	410,058,415	13	85,655,766	23
South Dakota	3,518,226	51	3,659,593	51	3,093,401	48
Tennessee	602,148,025	10	598,502,821	8	293,726,678	5
Texas	2,799,768,533	2	2,626,282,276	2	883,548,503	1
Utah	249,743,154	23	260,471,551	22	252,944,126	9
Vermont	4,889,666	50	5,012,856	50	2,565,828	49
Virgin Islands	7,424,628	48	7,424,628	48	2,123,058	51
Virginia	444,049,924	13	447,367,668	10	216,151,241	12
Washington	407,078,587	17	358,404,851	16	41,533,699	33
West Virginia	170,571,053	28	175,703,733	27	66,618,005	27
Wisconsin	184,957,138	26	169,525,412	28	96,712,911	22
Wyoming	62,596,791	38	58,859,954	39	33,789,026	37
GRAND TOTAL	22,519,044,091		21,267,366,353		6,977,432,542	

Data revisions for most states were relatively small. In fact, two thirds of the net decrease (66 percent) in TRI releases and transfers occurred in three states—Michigan, Mississippi, and South Carolina. TRI totals decreased in Michigan by 50 percent, in Mississippi by 56 percent, and in South Carolina by 20 percent. Data changes for five states—California, Ohio, Wisconsin, Michigan, and Texas—accounted for 41 percent of the increase in number of facilities, and a large share of the increase in forms. These changes did result in some shifts in the overall patterns of geographical distribution. (See Table 2-2.)

Data revisions by facilities in 3 states accounted for 2/3 of the decrease.

Revisions to 1987 data scarcely affected the nationwide environmental and industrial distribution of TRI totals. Off-site transfers as well as direct releases to surface water and land decreased proportionally; only air emissions increased. Decreases also split evenly among industries, producing only minor shifts in the industrial rankings. Similarly, few top-ranked chemicals were affected by data revisions. The chemical category manganese compounds was the only exception: 1987 totals of the category originally came to 114.7 million pounds, but revisions halved the amount to 57.3 million pounds, dropping the chemical category from 21st to 28th largest for total TRI releases and transfers. (See Figure 2-1, Tables 2-3 and 2-4.)

Data revisions did not significantly change the environmental, industrial, or chemical distribution.

Table 2-3. TRI Total Releases and Transfers by Industry for Original, Revised, and Adjusted Data, 1987.

SIC CODE	INDUSTRY	ORIGINAL 1987 DATA		REVISED 1987 DATA		ADJUSTED 1987 DATA	
		Pounds	Rank	Pounds	Rank	Pounds	Rank
20	Food Products	287,011,684	10	253,986,843	11	67,048,081	13
21	Tobacco Manufacturers	10,461,881	21	8,600,855	21	7,268,625	21
22	Textile Mill Products	349,911,142	6	335,128,859	6	68,613,808	12
23	Apparel	4,770,371	22	5,951,727	22	2,650,724	22
24	Lumber and Wood Products	35,960,744	20	35,405,321	20	31,804,406	19
25	Furniture and Fixtures	59,715,475	17	61,980,476	17	61,182,687	15
26	Paper Products	2,807,409,484	2	2,840,103,253	2	377,958,408	4
27	Printing, Publishing	62,936,388	16	64,036,431	16	63,380,815	14
28	Chemical Products	12,088,829,671	1	11,569,757,962	1	3,331,892,430	1
29	Petroleum Refining	762,361,469	5	777,927,078	5	182,108,630	9
30	Rubber and Plastic Products	277,096,613	11	288,432,237	10	190,996,017	8
31	Leather Products	52,087,328	18	52,598,891	18	41,965,475	17
32	Stone, Clay, Glass Products	116,968,737	13	118,906,485	13	57,634,258	16
33	Primary Metals	2,593,238,041	3	2,008,656,056	3	947,963,814	2
34	Fabricated Metals	306,289,006	8	292,993,992	9	233,597,136	6
35	Machinery, except Electrical	99,091,372	14	103,310,261	14	78,172,754	10
36	Electric and Electronic Equip.	297,117,232	9	295,372,011	8	220,944,128	7
37	Transportation Equipment	332,397,007	7	327,920,474	7	296,186,174	5
38	Measuring, Photographic Goods	81,141,337	15	88,448,010	15	78,145,426	11
39	Misc. Manufacturing	36,324,473	19	37,349,964	19	35,558,546	18
	Multiple SIC codes in 20 - 39	1,709,984,714	4	1,549,709,489	4	579,638,062	3
	No SIC codes in 20 - 39	147,939,922	12	150,789,678	12	22,722,138	20
	TOTAL	22,519,044,091		21,267,366,353		6,977,432,542	

Table 2–4. The 25 Chemicals with the Largest TRI Total Releases and Transfers (1987 Original Data) Compared to Revised and Adjusted Data.

CHEMICAL	ORIGINAL 1987 DATA Pounds	Rank	REVISED 1987 DATA Pounds	Rank	ADJUSTED 1987 DATA Pounds	Rank
SODIUM SULFATE*	12,079,565,192	1	11,692,909,597	1	0	—
ALUMINUM OXIDE*	2,434,973,644	2	2,054,070,045	2	0	—
AMMONIUM SULFATE	917,843,516	3	814,932,127	3	814,932,127	1
HYDROCHLORIC ACID	656,744,356	4	644,856,938	4	644,856,938	2
SULFURIC ACID	642,751,448	5	478,195,883	6	478,195,883	3
SODIUM HYDROXIDE*	626,849,514	6	541,123,005	5	0	—
AMMONIA	444,484,887	7	402,143,039	8	402,143,039	5
METHANOL	419,546,588	8	435,550,127	7	435,550,127	4
TOLUENE	344,565,192	9	362,178,333	9	362,178,333	6
PHOSPHORIC ACID	343,922,311	10	340,343,982	10	340,343,982	7
ACETONE	234,592,029	11	252,961,335	11	252,961,335	8
XYLENE (MIXED ISOMERS)	217,664,213	12	224,213,405	12	224,213,405	9
METHYL ETHYL KETONE	192,748,517	13	197,310,127	13	197,310,127	10
1,1,1-TRICHLOROETHANE	181,918,560	14	189,130,017	15	189,130,017	12
COPPER	177,878,091	15	170,892,545	16	170,892,545	13
ZINC COMPOUNDS	176,576,887	16	193,484,430	14	193,484,430	11
DICHLOROMETHANE	152,289,040	17	155,627,785	17	155,627,785	14
CARBON DISULFIDE	136,715,512	18	136,423,873	18	136,423,873	15
CHLORINE	131,235,577	19	121,511,240	19	121,511,240	16
AMMONIUM NITRATE	114,848,028	20	115,406,312	20	115,406,312	17
MANGANESE COMPOUNDS	114,736,785	21	57,269,705	28	57,269,705	25
NITRIC ACID	98,136,781	22	75,078,121	22	75,078,121	19
ZINC (FUME OR DUST)	91,347,809	23	97,538,784	21	97,538,784	18
ETHYLENE	69,472,028	24	60,942,381	25	60,942,381	22
FREON 113	62,361,207	25	64,410,204	23	64,410,204	20
SUBTOTAL	21,063,767,712		19,878,503,340		5,590,400,693	
TOTAL FOR ALL OTHERS	1,455,276,379		1,388,863,013		1,387,031,849	
GRAND TOTAL	22,519,044,091		21,267,366,353		6,977,432,542	

* Delisted chemicals

Table 2–5. TRI Releases and Transfers of Delisted Chemicals, 1987 Revised Data.

CHEMICAL	FORMS Number	AIR Pounds	SURFACE WATER Pounds	LAND Pounds	UNDERGROUND Pounds	TOTAL RELEASES Pounds
SODIUM SULFATE	1,442	5,702,838	8,684,833,416	93,085,030	1,719,631,878	10,503,253,162
ALUMINUM OXIDE	1,381	86,066,031	10,877,527	1,387,456,915	2,724,250	1,487,124,723
SODIUM HYDROXIDE	7,066	7,108,225	48,652,126	123,607,472	27,117,510	206,485,333
MELAMINE	84	181,258	537,048	5,530	25,000	748,836
C.I. ACID BLUE						
Disodium Salt	5	1,541	0	250	0	1,791
Diammonium Salt	2	0	0	0	0	0
SUBTOTAL	9,980	99,059,893	8,744,900,117	1,604,155,197	1,749,498,638	12,197,613,845
TOTAL FOR ALL OTHERS	66,757	2,574,968,562	403,072,288	730,895,340	1,298,736,401	5,007,672,591
1987 REVISED TRI TOTAL	76,737	2,674,028,455	9,147,972,405	2,335,050,537	3,048,235,039	17,205,286,436

HOW 1987 ADJUSTED DATA DIFFERS FROM 1987 REVISED DATA: HIGHLIGHTS

Data revisions affected the TRI totals in fairly minor ways, but the changes in 1988 TRI reporting requirements (described in Chapter 1) are far more influential. The following section describes the adjustments to 1987 data necessary to compensate for these changes to make 1987 data more readily comparable to 1988 totals. The differences between *revised* and *adjusted* data are highlighted here; the chapter concludes with a general summary of the adjusted data.

Since the 1987 reporting deadline, EPA removed (delisted) six chemicals from the TRI list because the Agency determined the chemicals were not sufficiently toxic to warrant reporting. Three of the six—sodium sulfate, aluminum oxide, and sodium hydroxide—were originally among the top 25 chemicals for 1987, together accounting for over two thirds of the TRI total for 1987. Four chemicals were delisted before 1988 reports were due (sodium sulfate; C.I. Acid Blue, diammonium salt; C.I. Acid Blue, disodium salt; and melamine) while two (sodium hydroxide and aluminum oxide) were delisted after the 1988 reporting deadline. (Note that forms were submitted for the latter two, but the data is not included here.) Without these six chemicals, the portrait of TRI releases and transfers for 1987 changes dramatically. (See Tables 2-4 and 2-5.)

6 chemicals—including sodium sulfate, aluminum oxide, and sodium hydroxide—were deleted from the TRI list since 1987.

Sodium sulfate accounted for 55 percent (11.7 billion pounds) of total releases and transfers in 1987. Aluminum oxide accounted for ten percent (2.1 billion pounds), and sodium hydroxide accounted for another three percent (541.1 million pounds). The other delisted chemicals each accounted for much smaller amounts. Without these six chemicals, total releases and transfers for 1987 drop from 21.3 billion pounds to 7.0 billion pounds, or 67 percent. (See Tables 2-4 and 2-5.)

The TRI total drops from 21.3 to 7.0 billion pounds when the deleted chemicals are subtracted.

Table 2-5, continued.

CHEMICAL	PUBLIC SEWAGE Pounds	OFF-SITE TRANSFERS Pounds	TOTAL TRANSFERS Pounds	TOTAL RELEASES & TRANSFERS Pounds	Percent
SODIUM SULFATE	1,063,232,900	126,423,535	1,189,656,435	11,692,909,597	54.98
ALUMINUM OXIDE	3,097,155	563,848,167	566,945,322	2,054,070,045	9.66
SODIUM HYDROXIDE	200,781,851	133,855,821	334,637,672	541,123,005	2.54
MELAMINE	62,937	786,780	849,717	1,598,553	0.01
C.I. ACID BLUE,					
Disodium Salt	215,870	14,200	230,070	231,861	0.00
Diammonium Salt	0	750	750	750	0.00
SUBTOTAL	1,267,390,713	824,929,253	2,092,319,966	14,289,933,811	67.19
TOTAL FOR ALL OTHERS	614,834,961	1,353,924,990	1,968,759,951	6,977,432,542	32.81
1987 REVISED TRI TOTAL	1,882,225,674	2,178,854,243	4,061,079,917	21,267,366,353	100.00

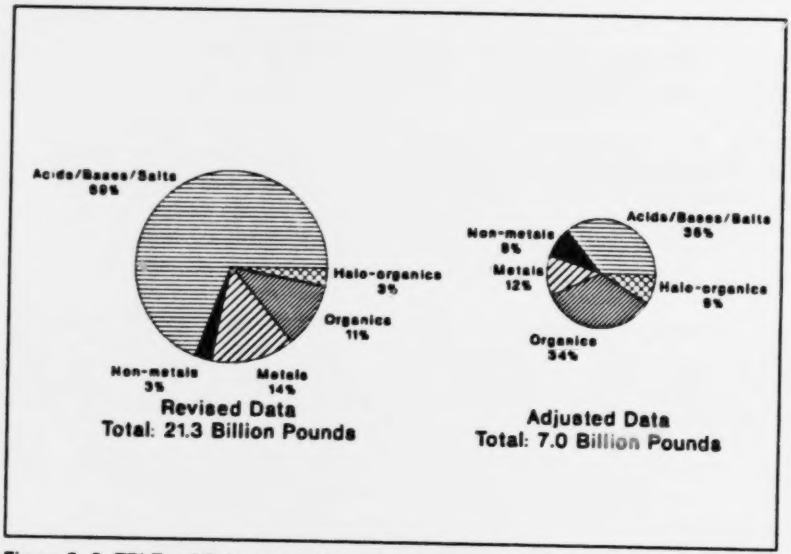

Figure 2-2. TRI Total Releases and Transfers by Chemical Class, 1987, Revised and Adjusted Data.

Subtracting the delisted chemicals alters the chemical composition of 1987 TRI totals.

Because the delisted chemicals sodium sulfate, sodium hydroxide, and aluminum oxide all played large roles in 1987, adjusting for their removal from the TRI list alters the overall chemical composition of TRI totals. For example, the delisted chemicals sodium sulfate and sodium hydroxide are both members of the acids/bases/salts class (explained in Chapter 4). Because each contributed a significant portion to the 1987 TRI total, subtracting the amounts for the two causes the total for the class as a whole to drop from 14.7 to 2.5 billion pounds (an 83-percent decrease). In proportional terms, acids/bases/salts originally comprised 69 percent of the 1987 total, but make up 36 percent of the adjusted total. (See Figure 2-2.)

Discharges to surface water drop from the largest to the smallest component of TRI totals; air emissions move into first place.

The adjustment for the delisted chemicals, most notably sodium sulfate and aluminum oxide, also brings about marked changes in the environmental distribution of TRI releases and transfers. Because sodium sulfate alone made up 95 percent of the discharges to surface water, this category shifts from comprising the largest share of original TRI totals (43 percent) to the smallest share of adjusted totals (six percent). Likewise, aluminum oxide comprised 59 percent of the original total for land disposal, so the adjusted proportion of land disposal is smaller than the original. (See Figure 2-1, Tables 2-4 and 2-5.)

California drops out of the top 10 states for 1987 TRI totals in the adjusted data.

The geographical distribution of adjusted TRI totals for 1987 differs in several notable ways from the original data. California, which originally had the largest amount of TRI chemical releases and transfers, drops to 11th in the nation (from 5.8 billion pounds to 227.2 million pounds). This change arises from the fact that a single facility in California released 5.2 billion pounds of the delisted chemical sodium sulfate in 1987—23 percent of total national TRI releases and transfers in 1987 and 90 percent of California's total. In contrast, Utah facilities generated few releases and transfers of the delisted chemicals, so that state increases in rank from 22nd to ninth. (See Table 2-2 and Figure 2-3.)

The 1987 adjusted data contains 6% fewer TRI facilities.

A sizable number of facilities (1,169) reported only one or more of the six chemicals that have been removed from the TRI list. Thus, the adjusted number of TRI facilities drops from 20,015 to 18,846. The overall geographical distribution of TRI facilities remains substantially the same, however. (See Table 2-2.)

Adjustments scarcely affect the industrial distribution.

Industrial rankings do not change significantly when 1987 data are adjusted to exclude delisted chemicals. The Chemical industry still accounts for a larger amount of TRI releases and transfers than any other industry, with a total of 3.3 billion pounds or 48 percent of the TRI total for all industries. Other shifts are minor, suggesting that the reporting of the six delisted chemicals was evenly distributed among industries. (See Table 2-3.)

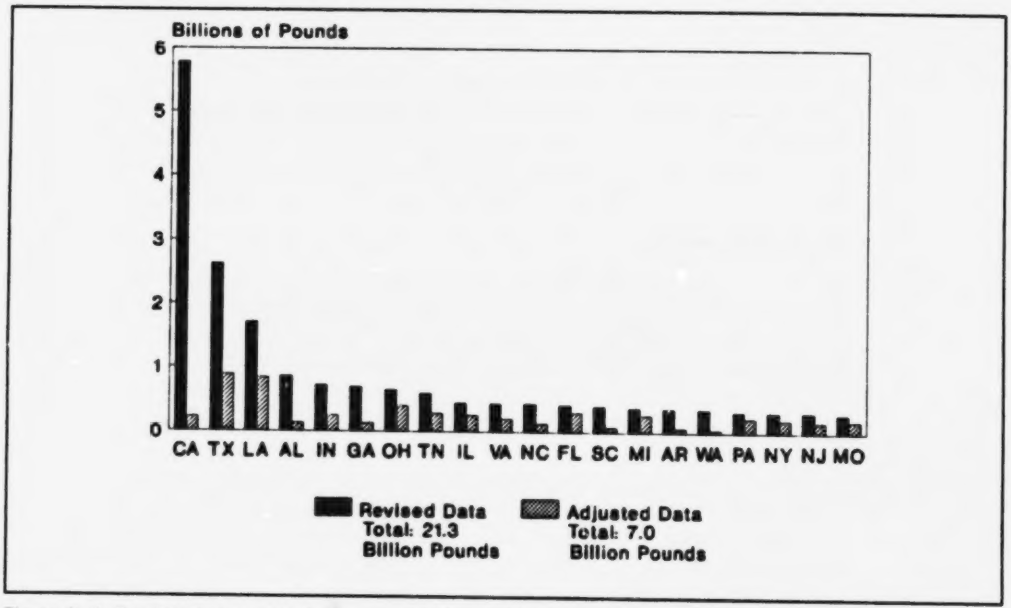

Figure 2-3. The 20 States with the Largest TRI Total Releases and Transfers, 1987: Revised and Adjusted Data. Rankings based on revised data. Some states dropped out of the top 20 after data were adjusted for the six delisted chemicals.

THE ADJUSTED 1987 TRI TOTALS: SUMMARY DATA FOR COMPARISON TO 1988

The 1987 adjusted data presented in the following sections are used throughout this report whenever comparisons to 1988 data are made. A similar summary of 1988 data is presented in Chapter 3.

Facilities released and transferred 7.0 billion pounds of TRI chemicals in 1987.

Manufacturing facilities reported releasing 5.0 billion pounds of TRI chemicals directly into the air, water, land, or underground wells for 1987, and an additional 2.0 billion pounds of TRI chemicals transferred off-site to other facilities, such as public sewage treatment plants or incinerators, for treatment or disposal. Overall, TRI encompassed 7.0 billion pounds of releases and transfers in 1987. (See Figure 2-1.)

Environmental Distribution

Air emissions were larger than surface water and on-site land releases combined.

When 1987 TRI totals are adjusted for delisted chemicals, manufacturers emitted larger amounts of TRI chemicals to air than the combined total discharged to surface water and disposed of on land. Facilities emitted 37 percent of their TRI totals (2.6 billion pounds) to air. Facilities pumped an additional 1.3 billion pounds (19 percent of the TRI total) into deep wells (underground injection) and disposed of 730.9 million pounds (ten percent) on land on-site. Discharges to surface water accounted for only six percent (403.1 million pounds).

Overall, total releases directly to air, water, and land added up to 5.0 billion pounds, while total transfers were 2.0 billion pounds. The transfers were made up of 1.4 billion pounds transferred to off-site facilities for treatment or disposal and 614.8 million pounds of TRI chemicals to public sewage systems.

Major Chemicals

25 chemicals comprised 80% of the 1987 adjusted TRI total.

The 25 chemicals with the largest adjusted TRI totals accounted for 80 percent (5.8 billion pounds) of all releases and transfers in 1987. Both ammonium sulfate and hydrochloric acid were released and transferred in amounts greater than 500 million pounds. (See Table 2-6.)

The environmental distribution of TRI chemicals varied considerably. Ammonium sulfate and hydrochloric acid accounted for the largest proportion of underground injection (39 percent and 32 percent, respectively). Ammonium sulfate also accounted for the largest proportion of discharges to public sewage plants (31 percent). Phosphoric acid accounted for 32 percent of discharges to surface water. Toluene accounted for more than ten percent of total air emissions of TRI chemicals. (See Table 2-6.)

Table 2-6. The 25 Chemicals with the Largest TRI Total Releases and Transfers, 1987 Adjusted Data.

RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS		AIR	SURFACE WATER	ON-SITE LAND	UNDER-GROUND	PUBLIC SEWAGE	OFF-SITE TRANSFERS
		Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent
1	AMMONIUM SULFATE	814,932,127	11.68	0.25	22.82	1.00	38.67	31.28	1.09
2	HYDROCHLORIC ACID	644,856,938	9.24	2.42	2.36	0.97	31.82	7.10	8.05
3	SULFURIC ACID	478,195,883	6.85	0.64	15.32	1.29	10.38	13.80	12.62
4	METHANOL	435,550,127	6.24	7.64	6.17	2.18	1.51	17.38	5.28
5	AMMONIA	402,143,039	5.76	10.77	7.55	0.67	3.68	5.83	0.42
6	TOLUENE	362,178,333	5.19	10.64	0.08	0.24	0.12	0.58	5.98
7	PHOSPHORIC ACID	340,343,982	4.88	0.06	31.89	25.61	0.00	2.01	0.78
8	ACETONE	252,961,335	3.63	7.42	0.50	0.04	0.18	2.36	3.15
9	XYLENE (MIXED ISOMERS)	224,213,405	3.21	5.56	0.07	0.09	0.05	0.70	5.55
10	METHYL ETHYL KETONE	197,310,127	2.83	5.81	0.02	0.01	0.01	0.11	3.46
11	ZINC COMPOUNDS	193,484,430	2.77	0.23	0.40	14.54	0.05	0.45	5.64
12	1,1,1-TRICHLOROETHANE	189,130,017	2.71	6.14	0.01	0.03	0.00	0.07	2.23
13	COPPER	170,892,545	2.45	0.10	0.05	18.93	0.03	0.09	2.13
14	DICHLOROMETHANE	155,627,785	2.23	4.98	0.09	0.01	0.04	0.29	1.80
15	CARBON DISULFIDE	136,423,873	1.96	5.27	0.01	0.00	0.01	0.03	0.02
16	CHLORINE	121,511,240	1.74	4.16	1.98	0.17	0.01	0.53	0.14
17	AMMONIUM NITRATE	115,406,312	1.65	0.29	3.01	2.08	4.51	1.59	0.90
18	ZINC (FUME OR DUST)	97,538,784	1.40	0.17	0.11	6.03	0.01	0.13	3.51
19	NITRIC ACID	75,078,121	1.08	0.27	0.63	0.18	0.70	4.69	1.95
20	FREON 113	64,410,204	0.92	2.14	0.01	0.00	0.00	0.02	0.67
21	TRICHLOROETHYLENE	62,206,897	0.89	2.00	0.01	0.01	0.00	0.02	0.77
22	ETHYLENE	60,942,381	0.87	2.36	0.00	0.00	0.00	0.00	0.00
23	STYRENE	59,433,848	0.85	1.21	0.03	0.05	0.00	0.08	2.02
24	GLYCOL ETHERS	58,622,937	0.84	1.62	0.04	0.00	0.02	0.92	0.81
25	MANGANESE COMPOUNDS	57,269,705	0.82	0.07	0.40	4.29	0.65	0.10	0.98
	SUBTOTAL	5,770,664,375	82.70	82.24	93.57	78.41	92.45	90.15	69.95
	TOTAL FOR ALL OTHERS	1,206,768,167	17.30	17.76	6.43	21.59	7.55	9.85	30.05
	GRAND TOTAL	6,977,432,542	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Chemical Classes

Two chemical classes—acids/bases/salts and non-halogenated organics—accounted for 69 percent of the adjusted releases and transfers for 1987. (Chemical classes are defined in Chapter 4.) The ten chemicals classified as acids/bases/salts accounted for 36 percent of the TRI total, while the non-halogenated organics accounted for 34 percent. Discharges to surface water, underground wells, and public sewage plants were still dominated by the acids/bases/salts class (76 percent of discharges to surface water, 87 percent of releases to underground wells, and 61 percent of discharges to public sewage plants), while non-halogenated organics comprise the largest share of TRI air emissions (59 percent) and off-site transfers (36 percent). (See Figure 2-4.)

Acids/bases/salts and organic compounds accounted for 70% of the TRI total.

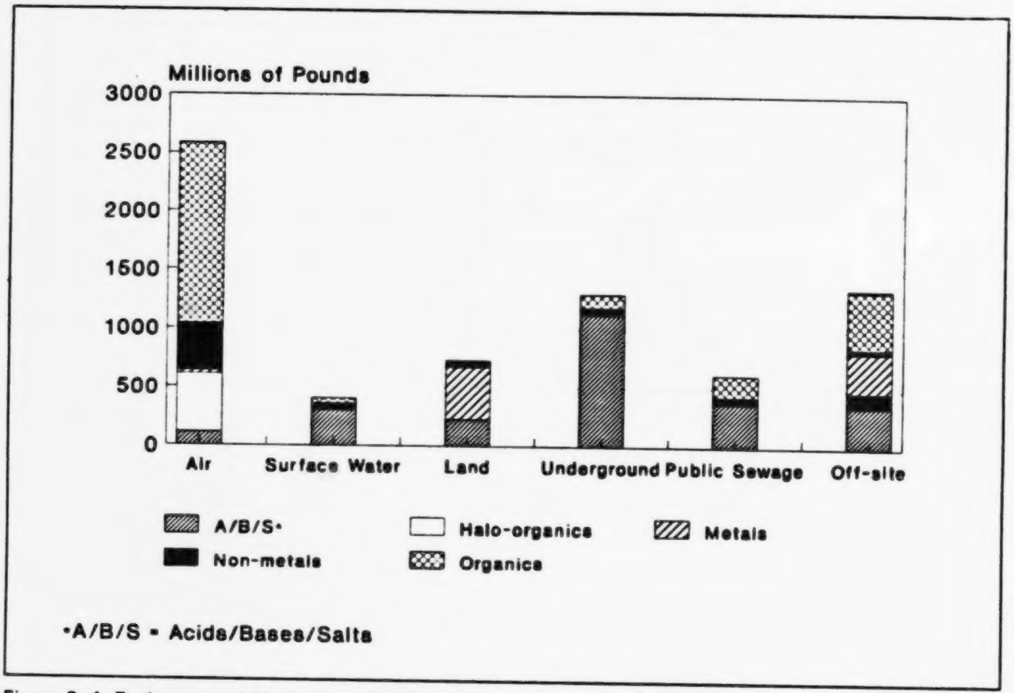

Figure 2-4. Environmental Distribution of TRI Releases and Transfers by Chemical Class, 1987 Adjusted Data.

Carcinogens

Carcinogens made up 8% of the 1987 adjusted TRI totals.

Of the TRI chemicals, 123 are considered carcinogens for the purpose of TRI reporting (see Chapter 4 for details on carcinogenicity and other health and environmental effects of TRI chemicals). Releases and transfers were reported for 81 of these carcinogens in 1987, accounting for eight percent (574.6 million pounds) of the adjusted total. The 25 top carcinogens accounted for 98 percent of the adjusted total for all carcinogens. Dichloromethane alone accounted for 27 percent (155.6 million pounds) of the carcinogen total; the chemical ranked 14th among all TRI chemicals for 1987 adjusted totals. (See Table 2-7.)

Table 2-7. The 25 Carcinogens with the Largest TRI Total Releases and Transfers, 1987 Adjusted Data.

TRI TOTAL RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	TOTAL RELEASES AND TRANSFERS Percent	PERCENT OF CARCINOGEN TOTAL
14	DICHLOROMETHANE	155,627,785	2.23	27.09
23	STYRENE	59,433,848	0.85	10.34
28	LEAD	47,615,994	0.68	8.29
31	TETRACHLOROETHYLENE	43,176,096	0.62	7.51
36	BENZENE	32,907,928	0.47	5.73
38	CHLOROFORM	30,522,680	0.44	5.31
42	FORMALDEHYDE	27,584,523	0.40	4.80
44	CHROMIUM	25,458,368	0.36	4.43
45	ASBESTOS (FRIABLE)	24,522,197	0.35	4.27
46	ACETONITRILE	22,774,488	0.33	3.96
51	NICKEL	17,165,365	0.25	2.99
52	1,2-DICHLOROETHANE	16,133,754	0.23	2.81
56	ACRYLONITRILE	11,250,310	0.16	1.96
61	1,3-BUTADIENE	9,922,040	0.14	1.73
69	ETHYLENE OXIDE	6,923,358	0.10	1.20
70	CARBON TETRACHLORIDE	6,608,570	0.09	1.15
78	PROPYLENE OXIDE	4,367,762	0.06	0.76
81	DI-(2-ETHYLHEXYL) PHTHALATE	4,107,920	0.06	0.71
84	POLYCHLORINATED BIPHENYLS (PCBs)	3,678,300	0.05	0.64
90	ISOPROPYL ALCOHOL	3,128,741	0.04	0.54
92	VINYL CHLORIDE	2,838,389	0.04	0.49
101	NITRILOTRIACETIC ACID	2,117,860	0.03	0.37
107	DIAMINOTOLUENE (MIXED ISOMERS)	1,726,977	0.02	0.30
110	TOLUENE-2,4-DIISOCYANATE	1,652,257	0.02	0.29
113	ARSENIC	1,562,438	0.02	0.27
SUBTOTAL		562,807,948	8.07	97.96
TOTAL FOR OTHER CARCINOGENS		11,745,430	0.17	2.04
CARCINOGEN TOTAL		574,553,378	8.23	100.00
GRAND TOTAL		6,977,432,542		

Table 2-8. Environmental Distribution of TRIReleases and Transfers by State, 1987 Adjusted Data.

TRI TOTAL RANK	STATE	FACILITIES Number	FORMS Number	AIR Pounds	SURFACE WATER Pounds	LAND Pounds	UNDERGROUND Pounds
19	Alabama	9	1,362	98,217,855	14,234,456	6,035,604	1,428,391
34	Alaska	347	56	31,324,172	4,763,515	13,930	0
53	American Samoa	286	3	56,250	0	0	0
25	Arizona	2	482	17,557,458	2,750	48,202,711	0
24	Arkansas	151	884	49,083,095	5,410,491	1,324,028	9,416,199
11	California	1,650	5,225	81,559,910	23,995,334	12,287,741	1,657,770
40	Colorado	159	463	10,168,740	234,128	5,243,113	1,250
29	Connecticut	382	1,294	26,801,799	10,121,227	1,146,808	0
45	Delaware	50	217	6,463,334	1,535,997	2,540,576	250
54	District of Columbia	0	0	0	0	0	0
4	Florida	407	1,153	50,505,521	19,351,962	180,901,946	22,572,490
17	Georgia	599	1,931	91,681,105	9,310,819	8,267,817	19,500
47	Hawaii	27	95	975,080	23,750	235,342	1,074,269
44	Idaho	43	133	3,870,922	551,799	12,266,257	0
7	Illinois	1,167	3,928	102,145,620	13,766,706	7,148,798	13,417,547
8	Indiana	699	2,535	110,653,475	5,914,585	23,892,520	32,976,624
31	Iowa	304	934	39,254,244	1,416,168	401,402	0
20	Kansas	185	683	24,896,642	1,465,493	345,979	65,957,410
21	Kentucky	283	1,215	44,840,930	1,511,837	3,646,695	25,000,250
2	Louisiana	255	1,614	135,202,095	193,067,227	1,521,897	484,943,681
41	Maine	89	327	15,874,624	900,946	320,332	0
32	Maryland	189	652	18,432,845	10,040,652	2,110,812	750
26	Massachusetts	557	1,657	31,256,802	147,226	775,632	250
6	Michigan	764	3,105	115,810,988	1,188,808	1,845,241	6,054,430
28	Minnesota	303	1,060	46,363,160	2,773,793	753,280	250
16	Mississippi	239	801	55,900,737	3,602,529	9,350,883	43,614,250
14	Missouri	479	1,726	49,761,871	2,839,792	50,374,501	1,000,250
36	Montana	25	128	2,750,456	136,622	31,414,887	0
42	Nebraska	133	387	14,214,021	1,741,506	367,410	0
50	Nevada	38	84	776,614	0	1,337,330	0
43	New Hampshire	134	402	12,664,114	882,541	606,169	0
15	New Jersey	857	2,986	43,289,398	1,680,843	1,943,353	530
39	New Mexico	33	114	3,895,229	4,316	17,219,765	0
13	New York	754	2,540	94,651,400	2,850,327	5,526,067	250
18	North Carolina	763	2,403	93,851,144	1,627,298	15,435,403	0
52	North Dakota	27	65	828,862	3,600	500	0
3	Ohio	1,264	4,712	135,263,552	8,011,913	26,429,236	64,927,648
30	Oklahoma	186	619	35,965,607	424,809	1,056,834	6,975,441
35	Oregon	190	603	19,576,823	371,720	1,274,922	0
10	Pennsylvania	987	3,640	90,574,986	6,090,680	12,886,408	16,250
38	Puerto Rico	156	508	12,852,037	298,152	72,100	988
46	Rhode Island	176	467	6,614,269	57,739	67,321	0
23	South Carolina	373	1,454	64,068,010	1,755,127	1,466,089	750
48	South Dakota	34	69	2,496,933	3,698	9	0
5	Tennessee	486	1,663	134,213,411	13,552,437	17,702,093	69,037,418
1	Texas	995	4,875	214,110,207	4,959,325	33,531,102	417,668,422
9	Utah	99	364	84,533,765	105,752	164,237,902	3
49	Vermont	51	136	1,236,903	475,199	55,908	0
51	Virgin Islands	1	21	2,032,803	3,250	87,005	0
12	Virginia	385	1,301	127,977,298	21,061,645	5,153,329	250
33	Washington	294	934	29,183,116	4,913,782	1,343,543	250
27	West Virginia	104	603	38,141,581	2,321,485	8,396,680	319,219
22	Wisconsin	652	2,032	49,040,922	1,475,295	1,871,431	1,500
37	Wyoming	24	112	2,505,827	91,237	458,699	30,651,671
TOTAL		18,846	66,757	2,575,968,562	403,072,288	730,895,340	1,298,736,401

Table 2-8, continued.

STATE	PUBLIC SEWAGE Pounds	OFF-SITE TRANSFERS Pounds	TOTAL RELEASES & TRANSFERS Pounds	PERCENT OF TRI TOTAL
Alabama	1,221,042	16,234,151	137,371,499	1.97
Alaska	0	14,389	36,116,006	0.52
American Samoa	0	0	56,250	0.00
Arizona	5,711,265	1,919,276	73,393,460	1.05
Arkansas	1,072,678	14,513,224	80,819,715	1.16
California	50,098,547	57,644,543	227,243,845	3.26
Colorado	1,500,669	3,538,728	20,686,628	0.30
Connecticut	2,551,002	21,162,043	61,782,879	0.89
Delaware	2,436,517	3,404,074	16,380,748	0.23
District of Columbia	0	0	0	0.00
Florida	17,015,621	13,534,264	303,881,804	4.36
Georgia	11,263,094	23,995,052	144,537,387	2.07
Hawaii	931,250	11,826	3,251,517	0.05
Idaho	361,894	244,507	17,295,379	0.25
Illinois	68,964,021	61,015,042	266,457,734	3.82
Indiana	16,224,002	67,135,891	256,797,097	3.68
Iowa	5,840,484	6,498,576	53,410,874	0.77
Kansas	4,328,650	37,869,939	134,864,113	1.93
Kentucky	2,798,515	42,788,824	120,587,051	1.73
Louisiana	489,285	28,944,270	844,168,455	12.10
Maine	1,154,797	1,763,930	20,014,629	0.29
Maryland	6,511,069	6,200,548	43,296,676	0.62
Massachusetts	12,555,083	27,882,036	72,617,029	1.04
Michigan	15,164,567	128,818,360	268,882,394	3.85
Minnesota	6,606,949	7,228,609	63,726,041	0.91
Mississippi	5,817,590	45,995,534	164,281,523	2.35
Missouri	72,741,613	17,470,590	194,188,617	2.78
Montana	1,087	167,082	34,470,134	0.49
Nebraska	730,232	2,411,251	19,464,420	0.28
Nevada	20,706	153,643	2,288,293	0.03
New Hampshire	886,552	4,105,683	19,145,059	0.27
New Jersey	50,857,883	74,903,155	172,675,162	2.47
New Mexico	33,793	621,955	21,775,058	0.31
New York	25,999,580	65,316,593	194,344,217	2.79
North Carolina	6,053,034	21,082,173	138,049,052	1.98
North Dakota	92,226	147,733	1,072,921	0.02
Ohio	26,175,762	150,305,945	411,114,056	5.89
Oklahoma	485,686	11,859,348	56,767,725	0.81
Oregon	8,679,082	6,212,455	36,115,002	0.52
Pennsylvania	13,804,122	104,772,918	228,145,364	3.27
Puerto Rico	5,656,580	4,862,427	23,742,284	0.34
Rhode Island	2,355,162	4,597,712	13,692,203	0.20
South Carolina	2,555,668	15,810,122	85,655,766	1.23
South Dakota	147,151	445,610	3,093,401	0.04
Tennessee	36,584,186	22,637,133	293,726,678	4.21
Texas	55,724,251	157,555,196	883,548,503	12.66
Utah	479,994	3,586,710	252,944,126	3.63
Vermont	124,424	673,394	2,565,828	0.04
Virgin Islands	0	0	2,123,058	0.03
Virginia	45,096,952	16,861,767	216,151,241	3.10
Washington	926,489	5,166,519	41,533,699	0.60
West Virginia	3,182,609	14,256,431	66,618,005	0.95
Wisconsin	14,821,546	29,502,217	96,712,911	1.39
Wyoming	0	81,592	33,789,026	0.48
TOTAL	614,834,961	1,353,924,990	6,977,432,542	100

Geographical Distribution

States

Texas and Louisiana led the nation for TRI totals.

Texas and Louisiana ranked first and second for total adjusted TRI releases and transfers, with 883.5 and 844.2 million pounds, respectively. Together, the two states accounted for 25 percent of the 1987 TRI totals. Texas had top-ranked levels of all types of releases except for discharges to surface water, and Louisiana ranked among the top five for air emissions, discharges to surface water, and underground injection. Texas manufacturers discharged the largest share of their TRI totals to underground (47 percent) and the second largest share to air (24 percent). Louisiana facilities also discharged the largest share of their TRI totals underground (57 percent), but the second largest share went to surface waters (23 percent). (See Figure 2-3 and Table 2-8.)

The environmental distribution of TRI totals varied from state to state. Facilities in two thirds of all states emitted the largest share of their toxic releases to air. Facilities in four Western states (Montana, Wyoming, New Mexico, and Utah), disposed of most of their TRI wastes on land (91, 91, 79, and 65 percent, respectively); in all, land disposal claimed the biggest fraction in seven states. Underground injection was the leading category in five states. Missouri was the only state in which facilities sent most of their TRI amounts to public sewage treatment plants. Michigan facilities transferred most of their TRI wastes off site, as did facilities in three other states.

Counties

Facilities in 25 counties generated 39% of the 1987 adjusted totals.

A significant fraction of the 1987 TRI totals were concentrated in just 25 counties (39 percent or 2.7 billion pounds). As might be expected from their status as top-ranked states, Texas and Louisiana each had five counties on the list. Releases and transfers were often concentrated into one or a few counties in a state. For example, Tooele County and Sedgwick County, accounted for over two thirds of TRI adjusted totals for Utah and Kansas, respectively. (See Table 2-9.)

Similarly, 1/3 of the carcinogen total originated in just 25 counties.

Carcinogen releases and transfers were highly concentrated in some localities: more than one third of the carcinogen total—193.7 of 574.6 million pounds—originated in 25 counties (out of the more than 3,000 counties in the nation). In seven states, one third or more of the statewide carcinogen total was released or transferred in a single county. There was no top-ranked county, however, in which carcinogens made up more than six percent of the total for all TRI releases and transfers in the state. (See Table 2-10.)

Table 2-9. The 25 Counties with the Largest TRI Total Releases and Transfers, 1987 Adjusted Data.

RANK	COUNTY	STATE	TOTAL RELEASES & TRANSFERS Pounds	PERCENT OF STATE TRI TOTAL	PERCENT OF TRI TOTAL
1	JEFFERSON	LA	218,170,633	25.84	3.13
2	ST CHARLES	LA	208,921,838	24.75	2.99
3	BRAZORIA	TX	205,072,687	23.21	2.94
4	HARRIS	TX	193,044,053	21.85	2.77
5	SALT LAKE	UT	162,917,736	64.41	2.33
6	ASCENSION	LA	148,850,046	17.63	2.13
7	ST JAMES	LA	134,483,324	15.93	1.93
8	JEFFERSON	TX	118,684,538	13.43	1.70
9	SEDGWICK	KS	106,507,135	78.97	1.53
10	POLK	FL	101,617,840	33.44	1.46
11	WAYNE	MI	95,882,689	35.66	1.37
12	HAMILTON	FL	92,240,300	30.35	1.32
13	LOS ANGELES	CA	89,076,930	39.20	1.28
14	CALHOUN	TX	82,611,432	9.35	1.18
15	COOK	IL	77,603,996	29.12	1.11
16	TOOELE	UT	77,024,300	30.45	1.10
17	HUMPHREYS	TN	75,102,727	25.57	1.08
18	LAKE	IN	70,511,673	27.46	1.01
19	ALLEN	OH	68,340,561	16.62	0.98
20	GALVESTON	TX	66,931,784	7.58	0.96
21	ST LOUIS	MO	63,613,504	32.76	0.91
22	MOBILE	AL	62,665,012	45.62	0.90
23	HOPEWELL CITY*	VA	59,723,642	27.63	0.86
24	ST CLAIR	IL	56,285,932	21.12	0.81
25	CALCASIEU	LA	55,779,734	6.61	0.80
SUBTOTAL			2,691,664,046		38.58
TOTAL FOR ALL OTHERS			4,285,768,496		61.42
GRAND TOTAL			6,977,432,542		100.00

* Hopewell City is included here because it is an independent city—that is, it does not belong to any county.

Cities

A large share of the TRI total (44 percent) originated in 50 cities, although only seven percent of all facilities that reported to TRI were located in these cities. Some of these had large numbers of facilities that together accounted for the city's top rank, while others had only one or a few facilities reporting very large releases and transfers. For example, only two facilities reported from Westwego, Louisiana, the city which topped the list for total releases and transfers. In contrast, 235 facilities reported to TRI from Chicago, Illinois—more facilities

44% of the 1987 national TRI total was generated by 7% of all TRI facilities in 50 cities, but cities with the most facilities did not always have the largest TRI totals.

than reported from any other top-ranked city—but the 35.1 million pounds of TRI releases and transfers originating in Chicago ranked 32nd. Thus, the largest city-wide releases and transfers did not necessarily originate in those cities with the most facilities. (See Table 2-11.)

Industrial Distribution

The Chemical industry generated 48% of the TRI adjusted total for 1987.

The Chemical industry produced more TRI releases and transfers than any other industry in 1987, with an adjusted total of 3.3 billion pounds or 48 percent of the TRI total for all industries. Chemical facilities produced more releases and transfers than any other industry in every environmental category except land disposal. Only one other industry—Primary Metals—had a TRI total of more than

Table 2-10. The 25 Counties wth the Largest TRI Total Releases and Transfers of Carcinogens, 1987 Adjusted Data

RANK	COUNTY	STATE	CARCINOGEN TOTAL RELEASES AND TRANSFERS Pounds	PERCENT OF STATE CARCINOGEN TOTAL	PERCENT OF STATE TRI TOTAL
1	HARRIS	TX	30,472,867	42.90	3.45
2	JEFFERSON	LA	14,274,800	39.37	1.69
3	WAYNE	MI	11,392,741	37.25	4.24
4	MONROE	NY	10,679,454	33.02	5.50
5	LOS ANGELES	CA	10,487,966	39.42	4.62
6	BRAZORIA	TX	9,101,704	12.81	1.03
7	JEFFERSON	MO	8,281,228	52.80	4.26
8	JEFFERSON	TX	7,753,964	10.92	0.88
9	KALAMAZOO	MI	7,416,476	24.25	2.76
10	BRADFORD	PA	7,183,946	20.59	3.15
11	LAKE	IN	6,890,985	16.06	2.68
12	POSEY	IN	6,726,700	15.68	2.62
13	CASS	IN	5,911,362	13.78	2.30
14	MARION	IN	5,375,436	12.53	2.09
15	STARK	OH	5,337,375	15.60	1.30
16	BROOME	NY	5,329,356	16.48	2.74
17	CALCASIEU	LA	5,190,727	14.32	0.61
18	BRADLEY	TN	5,016,935	27.69	1.71
19	VERMILLION	IN	4,754,600	11.08	1.85
20	ASCENSION	LA	4,599,175	12.69	0.54
21	ALLEN	OH	4,571,607	13.36	1.11
22	ORANGE	CA	4,499,657	16.91	1.98
23	SALT LAKE	UT	4,286,495	82.80	1.69
24	SAN DIEGO	CA	4,076,985	15.32	1.79
25	COOK	IL	4,056,318	21.81	1.52
SUBTOTAL			193,668,859	27.75	
TOTAL FOR OTHER CARCINOGENS			380,884,519	54.59	
CARCINOGEN TOTAL			574,553,378	82.34	
GRAND TOTAL			6,977,432,542	100.00	

Table 2-11. The 50 Cities with the Largest TRI Total Releases and Transfers, 1987 Adjusted Data.

RANK	CITY	COUNTY	STATE	FACILITIES Number	FORMS Number	TOTAL RELEASES & TRANSFERS (Pounds)
1	WESTWEGO	JEFFERSON	LA	2	23	213,444,514
2	NORCO	ST CHARLES	LA	2	24	194,234,200
3	ALVIN	BRAZORIA	TX	3	54	183,869,251
4	COPPERTON	SALT LAKE	UT	1	12	158,669,750
5	GEISMAR	ASCENSION	LA	9	157	107,501,726
6	WICHITA	SEDGWICK	KS	36	159	106,508,039
7	DONALDSONVILLE	ST JAMES/ASCENSION	LA	5	32	100,407,922
8	BEAUMONT	JEFFERSON	TX	15	183	98,542,016
9	WHITE SPRINGS	HAMILTON	FL	1	4	92,240,300
10	PORT LAVACA	CALHOUN	TX	3	51	81,299,552
11	ROWLEY	TOOELE	UT	1	6	76,992,400
12	HOUSTON	HARRIS	TX	119	468	76,436,996
13	NEW JOHNSONVILLE	HUMPHREYS	TN	3	18	75,102,727
14	MULBERRY	POLK	FL	4	17	72,330,450
15	LIMA	ALLEN	OH	9	64	68,131,217
16	PASADENA	HARRIS	TX	41	324	67,322,377
17	TEXAS CITY	GALVESTON	TX	13	229	66,756,513
18	SAINT LOUIS	SAINT LOUIS CITY	MO	114	403	66,650,685
19	HOPEWELL	HOPEWELL CITY	VA	7	49	66,577,498
20	UNCLE SAM	ST JAMES	LA	1	5	64,415,618
21	FRONT ROYAL	WARREN	VA	2	21	54,855,950
22	PASS CHRISTIAN	HARRISON	MS	1	9	46,396,867
23	LOUISVILLE	JEFFERSON	KY	56	300	45,034,090
24	SAUGET	ST CLAIR	IL	5	50	44,777,617
25	MEMPHIS	SHELBY	TN	71	268	44,249,589
26	KINGSPORT	SULLIVAN	TN	5	93	43,757,947
27	LEMOYNE	MOBILE	AL	1	6	43,139,315
28	DETROIT	WAYNE	MI	69	340	41,984,334
29	HERCULANEUM	JEFFERSON	MO	1	5	38,903,724
30	HAYDEN	GILA	AZ	1	7	36,423,780
31	PURVIS	LAMAR	MS	1	14	35,906,600
32	CHICAGO	COOK	IL	235	753	35,084,482
33	GLENS FALLS	WARREN	NY	6	44	34,250,940
34	EAST CHICAGO	LAKE	IN	8	56	33,946,995
35	CHEYENNE	LARAMIE	WY	2	31	31,598,944
36	EAST HELENA	LEWIS AND CLARK	MT	2	11	31,447,901
37	ROCHESTER	MONROE	NY	46	214	31,107,221
38	KENAI	KENAI-COOK INLET	AK	3	23	30,549,471
39	ODESSA	ECTOR	TX	8	89	29,356,565
40	CINCINNATI	HAMILTON	OH	102	392	28,000,343
41	ECORSE	WAYNE	MI	2	24	27,858,308
42	VERNON	LOS ANGELES	CA	20	55	27,712,425
43	ASHTABULA	ASHTABULA	OH	19	86	26,580,291
44	CLEVELAND	CUYAHOGA	OH	100	399	26,313,725
45	GONZALEZ	ESCAMBIA	FL	1	17	23,890,550
46	FERNANDINA BEACH	NASSAU	FL	2	13	22,129,250
47	CARLYSS	CALCASIEU	LA	1	4	21,974,323
48	PHILADELPHIA	PHILADELPHIA	PA	61	279	21,694,244
49	BALTIMORE	BALTIMORE CITY	MD	76	309	21,682,718
50	PORTAGE	KALAMAZOO	MI	2	28	21,583,050
	SUBTOTAL			1,298	6,222	3,039,625,310
	PERCENT OF GRAND TOTAL			6.89	9.32	43.56
	TOTAL FOR ALL OTHERS			17,548	60,535	3,937,807,232
	GRAND TOTAL			18,846	66,757	6,977,432,542

500 million pounds. Together, the Chemical and Primary Metals industries generated 61 percent of all adjusted releases and transfers for 1987. (See Table 2-12.)

Environmental distribution varied from industry to industry.

Underground injection and air emissions comprised 31 percent and 27 percent of the Chemical industry's total in 1987, while discharges to surface water comprised only nine percent. Land releases and off-site transfers accounted for the largest portion of the Primary Metals industry releases (43 and 28 percent, respectively). The Paper industry, fourth ranked overall, reported air emissions as the largest fraction (61 percent) of its TRI totals, making it the second largest emitter to air behind the chemical industry.

Facilities

More than 1/2 of the 18,846 manufacturing facilities that reported to TRI in 1987 were located in 10 states.

Excluding the 1,169 facilities that reported only delisted chemicals, a total of 18,846 facilities reported to TRI from 53 of the 55 jurisdictions covered by TRI—from all 50 states, Puerto Rico, the U.S. Virgin Islands, and American Samoa. No facilities reported from the District of Columbia or the Commonwealth of the Northern Mariana Islands. More than half of the facilities were located in ten states. California had the largest number of TRI facilities—1,650

Table 2-12. Environmental Distribution of TRI Releases and Transfers by Industry, 1987 Adjusted Data.

TRI RANK	INDUSTRY	SIC CODE	FORMS Number	FACILITIES Number	AIR Pounds	WATER Pounds	LAND Pounds	UNDERGROUND Pounds
13	Food Products	20	2,390	1,274	15,526,761	3,232,312	6,996,854	998,660
21	Tobacco Manufacturers	21	55	21	5,946,080	134,850	459	0
12	Textile Mill Products	22	817	386	39,041,935	7,717,193	290,250	0
22	Apparel	23	47	26	2,321,320	42,810	0	0
19	Lumber & Wood Products	24	1,661	599	27,296,805	57,682	123,063	0
15	Furniture & Fixtures	25	1,368	366	52,672,262	42,194	29,065	0
4	Paper Products	26	2,134	573	229,468,075	56,305,921	14,277,841	30,394
14	Printing, Publishing	27	567	290	55,159,502	3,521	253	0
1	Chemical Products	28	19,075	3,786	896,426,351	287,200,464	242,165,975	1,020,280,655
9	Petroleum Refining	29	2,939	333	66,878,346	4,895,238	9,297,978	18,597,002
8	Rubber & Plastic Products	30	2,837	1,188	152,699,022	339,290	194,279	49,800
17	Leather Products	31	405	116	14,214,593	463,176	166,320	0
16	Stone, Clay, Glass Products	32	1,381	516	25,989,275	667,346	3,219,204	6,319,000
2	Primary Metals	33	5,166	1,327	203,407,798	26,950,989	406,473,207	33,919,040
6	Fabricated Metals	34	7,244	2,443	115,604,986	3,064,556	2,983,275	1,261,361
10	Machinery, except Electrical	35	2,119	809	50,839,979	413,877	269,571	0
7	Electric & Electronic Equip.	36	4,637	1,468	118,558,878	1,103,129	4,577,271	81,736
5	Transportation Equipment	37	4,248	927	212,008,956	584,863	1,643,381	39,907
11	Measuring, Photographic	38	978	320	53,307,698	463,657	238,066	0
18	Misc. Manufacturing	39	879	349	25,865,866	167,052	246,873	250
3	Multiple SIC codes in 20 - 39		4,662	1,336	199,225,773	8,527,136	37,347,459	217,092,884
20	No SIC codes in 20 - 39		1,148	393	13,508,301	695,032	354,696	65,712
	TOTAL		66,757	18,846	2,575,968,56	403,072,288	730,895,340	1,298,736,401

facilities. Each of the top ten states had more than 650 facilities reporting, for a total of 9,900 facilities. (See Table 2-8.)

Concentrations of TRI releases and transfers in states and counties are often due to individual facilities with large releases and transfers. The top 50 facilities for adjusted 1987 TRI total releases and transfers, reported a total of 2.6 billion pounds, or 38 percent of all releases and transfers reported by the close to 19,000 facilities in the adjusted 1987 TRI. These top facilities contribute heavily to the chemical, geographical, and industrial distribution patterns described throughout this report; Part III shows their contribution to specific patterns in more detail. (See Table 2-13.)

Just 50 facilities reported 38% of all adjusted releases and transfers in 1987.

Table 2-12, continued.

INDUSTRY	SIC CODE	PUBLIC SEWAGE Pounds	OFF-SITE Pounds	TOTAL RELEASES & TRANSFERS Pounds	Percent
Food Products	20	36,104,044	4,189,450	67,048,081	0.96
Tobacco Manufacturers	21	989,740	197,496	7,268,625	0.10
Textile Mill Products	22	16,281,396	5,283,034	68,613,808	0.98
Apparel	23	119,831	166,763	2,650,724	0.04
Lumber and Wood Products	24	140,554	4,186,302	31,804,406	0.46
Furniture and Fixtures	25	542,935	7,896,231	61,182,687	0.88
Paper Products	26	45,525,233	32,350,944	377,958,408	5.42
Printing, Publishing	27	2,671,867	5,545,672	63,380,815	0.91
Chemical Products	28	347,691,106	538,127,879	3,331,892,430	47.75
Petroleum Refining	29	14,339,237	68,100,829	182,108,630	2.61
Rubber and Plastic Products	30	8,536,865	29,176,761	190,996,017	2.74
Leather Products	31	23,619,843	3,501,543	41,965,475	0.60
Stone, Clay, Glass Products	32	1,617,778	19,821,655	57,634,258	0.83
Primary Metals	33	16,239,994	260,972,786	947,963,[illegible]14	13.59
Fabricated Metals	34	25,857,584	84,825,374	233,597,136	3.35
Machinery, except Electrical	35	2,993,322	23,656,005	78,172,754	1.12
Electric & Electronic Equip.	36	21,202,822	75,420,292	220,944,128	3.17
Transportation Equipment	37	8,414,145	73,494,922	296,186,174	4.24
Measuring, Photographic	38	5,955,238	18,180,767	78,145,426	1.12
Misc. Manufacturing	39	1,220,017	8,058,488	35,558,546	0.51
Multiple SIC codes in 20 - 39		31,786,464	85,658,346	579,638,062	8.31
No SIC codes in 20 - 39		2,984,946	5,113,451	22,722,138	0.33
TOTAL		614,834,961	1,353,924,990	6,977,432,542	100.00

Table 2-13. The 50 Facilities with the Largest TRITotal Releases and Transfers, 1987 Adjusted Data.

RANK	SIC CODE	FACILITY NAME	CITY	COUNTY	STATE	TOTAL RELEASES & TRANSFERS Pounds	PERCENT OF TRI TOTAL
1	28	American Cyanamid Co.	Westwego	Jefferson	LA	213,444,502	3.06
2	M*	Shell Oil Co. - Mfg.	Norco	St Charles	LA	194,233,955	2.78
3	28	Monsanto Co.	Alvin	Brazoria	TX	175,647,400	2.52
4	33	Kennecott Utah Copper	Bingham Canyon	Salt Lake	UT	158,669,750	2.27
5	28	Occidental Chemical Corp.	White Springs	Hamilton	FL	92,240,300	1.32
6	28	Du Pont Beaumont Works	Beaumont	Jefferson	TX	85,470,600	1.22
7	28	Bp Chemicals Green Lake	Port Lavaca	Calhoun	TX	77,757,150	1.11
8	33	Amax Magnesium	Tooele	TooelE	UT	76,992,400	1.10
9	28	Du Pont Johnsonville Plant	New Johnsonville	Humphreys	TN	72,474,201	1.04
10	28	Royster Co.	Mulberry	Polk	FL	72,028,250	1.03
11	28	BP Chemicals Inc.	Lima	Allen	OH	67,392,200	0.97
12	28	Vulcan Chemicals	Wichita	Sedgwick	KS	67,289,968	0.96
13	28	Agrico Chemical Co.	Uncle Sam	St James	LA	64,415,618	0.92
14	28	Freeport McMoran	Donaldsonville	St James	LA	59,083,352	0.85
15	28	Arcadian Corp.	Geismar	Ascension	LA	56,447,250	0.81
16	28	Interesin Corp.	Houston	Harris	TX	54,300,139	0.78
17	28	Avtex Fibers Front Royal Inc.	Front Royal	Warren	VA	54,032,900	0.77
18	28	Allied-Signal Inc.	Hopewell	Hopewell City	VA	49,840,052	0.71
19	28	Columbian Chemicals Co.	Saint Louis	St Louis	MO	48,914,262	0.70
20	28	Du Pont Delisle Plant	Pass Christian	Harrison	MS	46,396,867	0.66
21	28	Courtaulds Fibers Inc.	Axis	Mobile	AL	43,139,315	0.62
22	28	Tennessee Eastman Co.	Kingsport	Sullivan	TN	42,332,395	0.61
23	28	Sterling Chemicals Inc.	Texas City	Galveston	TX	40,660,400	0.58
24	33	Herculaneum Smelter	Herculaneum	Jefferson	MO	38,903,724	0.56
25	28	Monsanto Co.	Cahokia	St Clair	IL	38,672,550	0.55
26	33	Asarco Inc.	Hayden	Gila	AZ	36,423,780	0.52
27	29	Amerada Hess Corp.	Purvis	Lamar	MS	35,906,600	0.51
28	28	CIBA-GEIGY Corp.	Queensbury	Warren	NY	33,109,650	0.47
29	M*	Inland Steel Co.	East Chicago	Lake	IN	31,466,950	0.45
30	33	Asarco Inc.	East Helena	Lewis & Clark	MT	31,431,511	0.45
31	28	Wycon Chemical Co.	Cheyenne	Laramie	WY	31,429,332	0.45
32	28	Racon Inc.	Wichita	Sedgwick	KS	30,738,632	0.44
33	28	Unocal Chemicals Div.	Kenai	Kenai Penin.	AK	30,416,150	0.44
34	28	BASF Corp.	Geismar	Ascension	LA	29,881,283	0.43
35	28	Air Products & Chemicals Inc.	Pasadena	Harris	TX	28,802,500	0.41
36	28	Rexene Products Co.	Odessa	Ector	TX	28,610,810	0.41
37	33	National Steel	Ecorse	Wayne	MI	27,652,318	0.40
38	28	Du Pont Louisville Works	Louisville	Jefferson	KY	26,113,000	0.37
39	28	Filtrol Corp.	Vernon	Los Angeles	CA	26,035,250	0.37
40	28	Monsanto Co.	Cantonment	Escambia	FL	23,890,550	0.34
41	M*	Eastman Kodak CO.	Rochester	Monroe	NY	23,083,946	0.33
42	26	ITT Rayonier Inc.	Fernandina Beach	Nassau	FL	22,129,250	0.32
43	28	W. R. Grace & Co.	Sulphur	Calcasieu	LA	21,974,323	0.31
44	28	Upjohn Co.	Kalamazoo	Kalamazoo	MI	21,583,050	0.31
45	28	Triad Chemical	Donaldsonville	Ascension	LA	20,521,651	0.29
46	28	Conserv Inc.	Nichols	Polk	FL	20,101,371	0.29
47	28	SCM Chemicals Inc.	Ashtabula	Ashtabula	OH	20,051,450	0.29
48	28	Allied-Signal Inc.	Elizabeth	Union	NJ	19,489,119	0.28
49	36	3M Mag Media & Consumer	Hutchinson	McLeod	MN	18,385,527	0.26
50	33	Midwest Steel Corp.	Portage	Porter	IN	17,332,792	0.25
		SUBTOTAL				2,647,340,295	37.94
		TOTAL FOR ALL OTHERS				4,330,092,247	62.06
		GRAND TOTAL				6,977,432,542	100.00

* M = Multiple SIC codes

PART II

Status of TRI Releases and Transfers

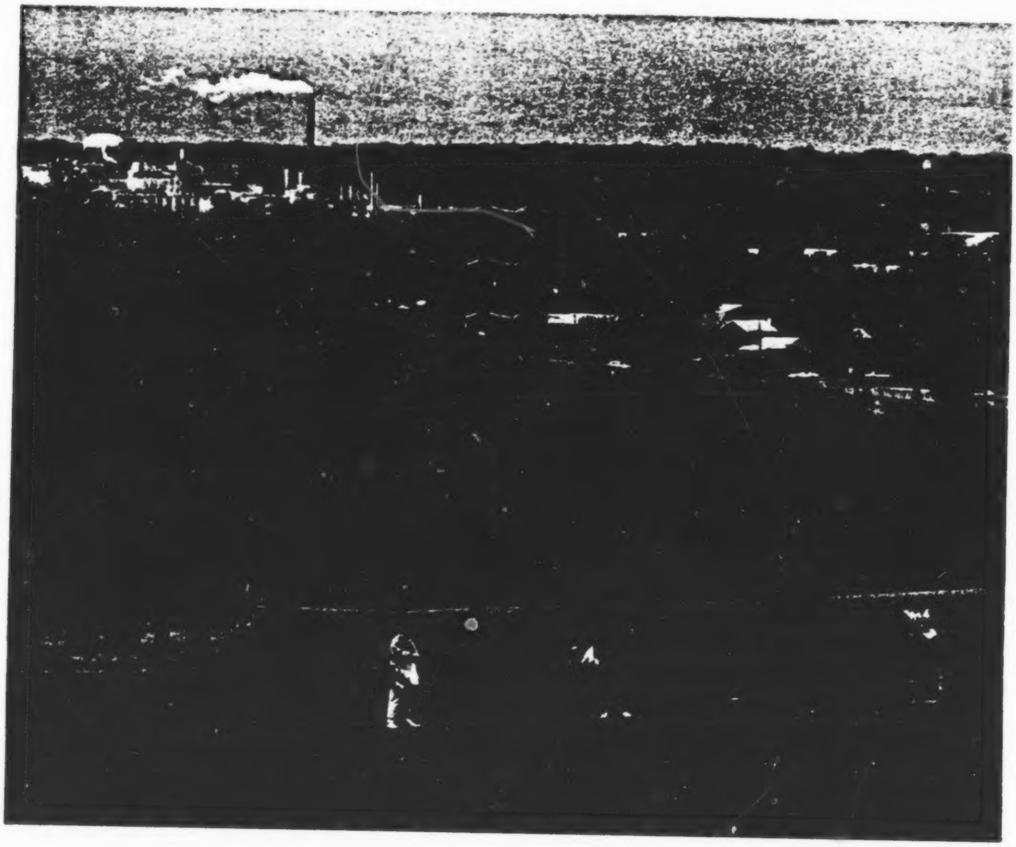

Photo: Daniel J. Kasztelan

CHAPTER 3. OVERVIEW OF 1988 TOXICS RELEASE INVENTORY DATA

Overall, 19,762 manufacturing facilities reported to the Toxics Release Inventory (TRI) a total of 6.2 billion pounds of environmental releases and off-site transfers of chemical wastes for 1988. Three quarters of this amount (4.5 billion pounds) were released directly into the air, water, land, or underground wells; the other quarter (1.7 billion pounds) was transferred off site from the originating facilities to waste management facilities such as public sewage treatment plants, incinerators or landfills. (See Box 3-A and Figure 3-1.)

19,762 facilities released and transferred 6.2 billion pounds of TRI chemicals in 1988.

While more facilities submitted more forms to TRI in 1988 than in 1987, the total amount of releases and transfers decreased. The number of facilities that reported to TRI increased five percent (916 facilities) from 18,846 facilities in 1987 to 19,762 facilities in 1988, while the number of forms submitted increased seven percent (4374 forms) from 66,757 in 1987 to 71,131 in 1988. This difference may stem from the fact that reporting thresholds decreased from 75,000 to 50,000 pounds of chemical manufacture (see Chapter 1), so facilities which fell under the cut-off in 1987 may have been over the cut-off in 1988. Total releases and

More facilities reported in 1988 than in 1987 but TRI releases and transfers decreased by 11%.

BOX 3-A. TRI TOTAL RELEASES AND TRANSFERS DEFINED

Throughout this report, TRI data presentations often refer to "total releases and transfers," which is more or less a measure of total wastes. While it is useful for comparative purposes to deal with a single sum in this manner, the reader should recognize that this aggregated total ignores some significant distinctions. "Releases" refer to discharges to the air, water, or land. Facilities determine these numbers after taking into account any reductions in waste achieved by on-site treatment methods. "Transfers" refer to wastes that are sent off-site for treatment or disposal. The "transfers" are reported in two categories—transfers to publicly owned sewage treatment works (POTWs) and other off-site transfers. The other off-site locations include incinerators, underground wells, landfills and other treatment or disposal facilities that are not part of the facility submitting the report to TRI. In many cases, these wastes will be reduced by treatment methods before any ultimate releases to the environment.

Even within the category of releases, there are further distinctions to bear in mind. Certain land releases, for example, are placed in disposal facilities which are designed and permitted to receive toxic materials. These wastes are therefore managed to significantly reduce potential for further distribution to the environment. Releases to the air and water, on the other hand, are not subject to further containment or control.

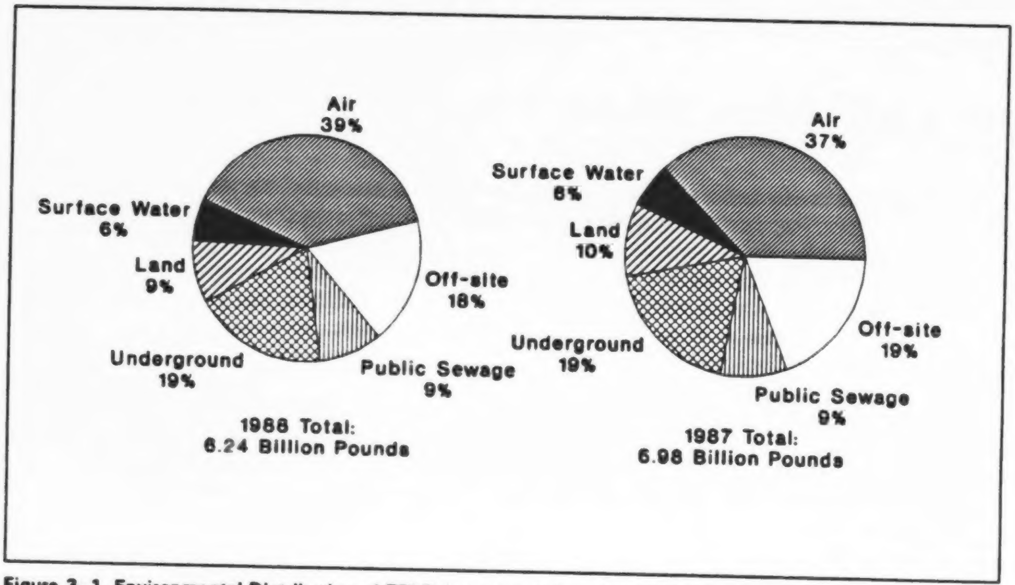

Figure 3-1. Environmental Distribution of TRI Releases and Transfers in 1987 and 1988.

transfers decreased by 11 percent (737.4 million pounds) from 7.0 billion pounds in 1987 to 6.2 billion pounds in 1988.

Air emissions were the largest single source of TRI releases and transfers in both 1987 and 1988.

The environmental distribution of releases and transfers did not change from 1987 to 1988. Air emissions were the largest single component of the 1988 total, accounting for 2.4 billion pounds (39 percent) of all TRI releases and transfers. Underground injection was the second largest form of release—1.2 billion pounds or 19 percent. And overall, direct releases to the environment were two and a half times greater than total off-site transfers.

TRI data can be analyzed according to the environmental distribution of releases of the chemicals, the geographical and industrial patterns of the releases and transfers, and the particular chemical components of the TRI totals. This chapter discusses the general patterns revealed by the 1988 data. Chapters 4, 5, and 6 take a more detailed look at the environmental distribution of releases and transfers within the broader chemical, geographical and industrial patterns. [1]

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(1) No reports for the six chemicals deleted from the TRI list for 1988 are included in the data in this or subsequent chapters (see Chapter 2). Keep in mind that national aggregates of TRI chemicals do not directly indicate risks. (See Box 3-B and Chapter 4.)

Analyses in this report are based on the April 6, 1990 version of the TRI database. EPA is constantly revising and updating the TRI database to add in late or revised forms, and to correct data entry errors (see Chapter 2). Several changes have been made since the statistics for this report were compiled; these changes, which affect many analyses, are listed in Box 3-C and Table 3-1.

BOX 3-B. TRI DATA AND EXPOSURE

The 4.5 billion pounds of TRI releases and 1.7 billion pounds of transfers are not an indicator of human or environmental exposure to these chemicals. Several factors should be kept in mind when considering the impact of TRI releases and transfers.

First, environmental releases do not always result in exposure. Landfills and underground injection are disposal methods designed to isolate wastes, and result in zero or low exposure unless they fail unexpectedly. Even chemical releases that are not isolated in this manner require careful interpretation. TRI reveals that 2.4 billion pounds of TRI chemicals were released directly to the air, and 361.6 million pounds to surface water in 1988. These releases cannot be equated directly to exposure, since each chemical in each individual release circumstance undergoes different transformations after release. Dilution may render exposure concentrations so small as to be of no concern. Gaseous emissions may be chemically transformed to harmless byproducts, or acidic wastewater discharges may be effectively neutralized by the receiving body of water. On the other hand, some environmental transformations lead to byproducts of even greater concern than the original releases. Each release scenario has its own unique characteristics.

TRI chemicals were also transferred to public sewage treatment plants and other off-site facilities, where they may undergo treatment (which can destroy or isolate a potentially toxic chemical) prior to ultimate disposal. The transfers also shift the location of materials, so that TRI releases generated in say, New Jersey, may be sent to Ohio for treatment and/or disposal. A knowledge of the ultimate fate of these materials would be needed for any meaningful interpretation of potential risks.

Lastly, TRI chemicals cover a broad spectrum of toxicity concerns. Total release or transfer amounts only give part of the story—a small release of a highly toxic chemical might be of much greater concern than a large release of a low-toxicity substance. In all cases, more information is needed to assess potential concerns than is provided by TRI data alone. TRI can only serve as an indicator of toxic chemical releases and transfers that may warrant additional examination.

BOX 3-C. CORECTIONS TO 1988 TRI DATA

EPA is constantly revising the TRI database due to corrections sent in by facilities, late submissions and data entry errors. As was seen for the 1987 TRI, more than 20,000 individual data items were changed. The data for this report were extracted from the EPA 1988 TRI database on April 6, 1990. Since then EPA has continued to update the data. The following major corrections were made after the data for this report were compiled:

Table 3-1. Corrections to 1988 TRI Data.

SIC CODE	FACILITY	CITY/COUNTY/ STATE	CHEMICAL	POUNDS BEFORE	POUNDS AFTER	DIFFERENCE	RELEASE OR TRANSFER TYPE
28	Courtaulds Fibers	Axis, Mobile, AL	Carbon Disulfide	0	42,900,000	42,900,000	Point Source Air
28	Du Pont Co.	Beaumont, Jefferson, TX	Ammonium Sulfate	100,000,000	110,000,000	10,000,000	Underground
26	ITT Rayioner	Fernandina Beach, Nassau, FL	Ammonium Sulfate	54,000,000	5,400,000	-48,600,000	Surface Water
36	General Electric	Pittsfield, Berkshire, MA	Polychlorinated Biphenyls	4,444,438	4,438	-4,440,000	Off-site
26*	Georgia Pacific	Brunswick, Glynn, GA	———	11,420,461	11,420,461	0	Total Releases And Transfers
28	Monsanto Co.	Alvin, Brazoria, TX	Ammonium Sulfate	100,000,000	190,000,000	90,000,000	Underground
26	Stone Container Corp.	Panama City, Bay, FL	Methanol	8	7,922,060	7,922,052	Public Sewage

*Georgia Pacific corrected their SIC code from 21 (Tobacco) to 26 (Pulp Mills).

These corrections affect some of the detailed analysis of rankings of states, chemicals and industries that are done in subsequent chapters in this report and are noted in footnotes with reference made back to this box for the details.

CHEMICAL COMPOSITION

85% of the national TRI total was composed of just 25 chemicals. 40% of the TRI chemicals had TRI totals of over 1 million pounds.

Twenty-five chemicals constituted 85 percent of all TRI releases and transfers in 1988 (see Chapter 4). Ammonium sulfate and hydrochloric acid made up one fifth of all releases and transfers and were the only chemicals with a TRI total of greater than 500 million pounds each. (The delisted chemical aluminum oxide was also reported in large amounts—see Box 3-D and Chapter 2). A total of 121 of the 322 TRI chemicals and categories listed for 1988 were released and transferred in quantities of over one million pounds, while 74 chemicals were in amounts smaller than 1,000 pounds, or not at all.

Individual chemicals played distinctive roles in the distribution of releases and transfers. Ammonium sulfate accounted for one third of discharges to underground wells, public sewage treatment plants, and surface water. Phosphoric acid also represented one third of all discharges to surface water. Hydrochloric acid represented one third of all discharges to underground wells. Zinc compounds represented 20 percent of all on-site land releases. Toluene represented 11 percent of total air releases. Chapters 8 through 10 detail the prominence of certain chemicals in each form of release or transfer.

ENVIRONMENTAL DISTRIBUTION

Larger amounts of TRI chemicals were emitted to air in 1988 than were released to the environment in any other form or transferred off-site. Over one third (2.4 billion pounds) of the TRI total was emitted to air. Underground wells received 1.2 billion pounds (19 percent). Facilities disposed of 561.6 million pounds (nine percent of the TRI total) on land at the facility site and discharged 361.6 million pounds (six percent) to surface water. (See Figures 3-1 and 3-2, and Table 3-2.)

39% of the TRI total was released to air, 19% to underground wells, 9% to land, and 6% to surface water.

BOX 3-D. THE ALUMINUM OXIDE STORY

Aluminum oxide releases and transfers of 1.5 billion pounds were far larger than any other chemical reported to TRI for 1988. Aluminum oxide accounted for one fifth of total releases and transfers for all TRI chemicals. Ninety-four percent of the aluminum oxide total was disposed of on land or transferred to off-site locations other than public sewage plants. Aluminum oxide accounted for 50 percent of all on-site land releases and 39 percent of total off-site transfers (other than to public sewage plants).

Aluminum oxide is a common by-product from numerous manufacturing processes, including the production of pigments, ore processing, newsprint, clays, and so on. The compound may form fibers or it may be found in the form of fumes or dust. EPA removed the *nonfibrous* forms of aluminum oxide from the TRI list for 1989 reporting after concluding that the compound did not cause, nor could be reasonably anticipated to cause, significant adverse human health or environmental harms under normal industrial conditions.

If the 1988 data reported for aluminum oxide were included in analyses in this report, the distribution of releases and transfers for 1988 would have been somewhat different, although the ranking of type of release or transfer would not change: air emissions would still rank first; land disposal would still rank third. For example, without aluminum oxide, the total for on-site land releases accounted for 9 percent of the TRI total in 1988. With aluminum oxide, on-site land releases would increase to 16 percent of total TRI releases and transfers in 1988. Similarly, off-site transfers other than to public sewage plants, which accounted for 18 percent of the TRI total without aluminum oxide, would represent 24 percent of the TRI total with aluminum oxide and total off-site transfers would represent one quarter rather than one third of total TRI releases and transfers.

Table 3-2. Environmental Distribution of TRI Releases and Transfers by State, 1988.

TRI TOTAL RANK	STATE	TOTAL RELEASES AND TRANSFERS Pounds	AIR Percent	SURFACE WATER Percent	LAND Percent	UNDER-GROUND Percent	PUBLIC SEWAGE Percent	OFF-SITE Percent
22	Alabama	84,062,842	64.50	8.22	5.47	1.94	1.46	18.41
38	Alaska	26,476,465	83.08	16.14	0.01	0.00	0.00	0.76
53	American Samoa	29,500	100.00	0.00	0.00	0.00	0.00	0.00
24	Arizona	74,657,306	19.80	0.01	72.01	0.00	6.06	2.11
25	Arkansas	72,272,458	64.76	10.30	2.68	9.74	1.53	10.99
9	California	201,568,789	40.48	5.47	9.01	0.47	24.12	20.46
42	Colorado	21,132,981	52.66	0.42	12.41	0.00	8.89	25.62
30	Connecticut	53,449,946	44.81	13.67	3.14	0.00	5.23	33.16
46	Delaware	10,692,005	45.58	5.37	2.35	0.00	21.24	25.46
54	District of Columbia	1,000	25.00	25.00	0.00	0.00	25.00	25.00
6	Florida	249,655,746	21.27	22.35	33.07	13.88	3.51	5.92
18	Georgia	131,410,860	62.81	4.95	6.98	0.04	6.59	18.62
49	Hawaii	2,964,331	29.49	0.34	6.06	35.47	28.18	0.46
44	Idaho	15,105,613	26.36	1.96	67.35	0.01	3.41	0.90
5	Illinois	251,302,153	41.62	5.69	4.17	2.92	23.54	22.06
4	Indiana	276,346,921	39.83	1.76	22.81	12.60	4.37	18.62
28	Iowa	58,668,674	73.52	2.67	0.41	0.00	10.67	12.73
13	Kansas	174,468,243	14.12	0.46	0.28	52.02	1.94	31.18
19	Kentucky	131,319,642	33.31	1.29	4.37	22.85	1.80	36.39
1	Louisiana	741,206,814	17.95	21.23	0.27	57.11	0.48	2.95
41	Maine	21,965,123	75.36	2.00	4.35	0.00	12.44	5.84
36	Maryland	33,340,174	52.14	11.27	8.00	0.00	11.88	16.72
26	Massachusetts	70,821,565	37.41	0.99	1.28	0.01	23.51	36.81
8	Michigan	231,681,301	41.28	0.50	7.59	2.42	6.83	41.37
27	Minnesota	65,506,519	75.39	4.21	1.36	0.00	10.01	9.03
20	Mississippi	120,820,916	44.67	1.64	7.45	38.74	1.13	6.37
12	Missouri	184,627,555	26.34	2.22	21.76	0.00	42.03	7.64
34	Montana	35,467,330	6.72	0.35	92.79	0.00	0.00	0.13
40	Nebraska	22,649,337	77.26	1.37	0.24	0.30	3.87	16.96
47	Nevada	4,874,292	14.87	0.01	71.61	0.00	0.40	13.12
43	New Hampshire	15,171,504	76.82	3.19	2.83	0.00	3.32	13.83
15	New Jersey	162,741,774	22.44	0.62	1.77	0.00	33.07	42.10
30	New Mexico	24,398,821	7.72	0.00	91.27	0.00	0.15	0.86
14	New York	172,106,105	53.92	1.21	0.66	0.00	14.90	29.30
17	North Carolina	136,857,071	64.55	0.51	14.33	0.00	5.48	15.14
52	North Dakota	1,394,580	88.65	0.26	0.05	0.00	3.78	7.26
3	Ohio	375,989,294	36.29	1.57	8.03	15.14	5.90	33.07
31	Oklahoma	51,720,309	60.13	0.70	3.46	12.28	0.82	22.60
35	Oregon	33,604,243	59.18	0.90	3.07	0.00	21.03	15.81
10	Pennsylvania	201,102,129	40.27	2.21	8.17	0.00	7.68	41.67
37	Puerto Rico	28,842,935	53.96	0.43	0.38	0.00	27.85	17.39
45	Rhode Island	12,568,955	45.94	3.07	1.26	0.00	15.36	34.38
23	South Carolina	82,177,534	76.19	1.95	1.59	0.00	3.27	17.00
48	South Dakota	3,059,629	81.02	0.08	0.00	0.00	5.13	13.77
7	Tennessee	249,417,227	53.60	2.57	5.30	20.01	9.87	8.65
2	Texas	724,477,706	23.46	0.59	4.26	53.95	5.58	12.16
16	Utah	137,472,389	86.86	0.19	11.17	0.00	0.65	1.12
50	Vermont	2,374,596	63.98	4.76	1.03	0.00	3.06	27.17
51	Virgin Islands	1,633,634	91.26	0.15	8.59	0.00	0.00	0.00
11	Virginia	196,619,903	60.82	10.06	2.57	0.00	19.68	6.86
32	Washington	50,338,221	54.84	26.84	1.82	0.00	1.94	14.56
29	West Virginia	57,901,379	55.07	5.39	1.23	0.17	5.77	32.38
21	Wisconsin	105,049,429	42.28	0.51	6.61	0.00	21.33	29.27
33	Wyoming	45,464,978	6.43	0.09	33.60	59.64	0.02	0.22
	TOTAL	6,241,030,746	38.90	5.79	9.00	19.47	9.14	17.70

In addition to direct releases to the environment, manufacturers discharged 570.6 million pounds of TRI chemicals (nine percent of the TRI total) to public sewage treatment plants and transferred another 1.1 billion pounds (18 percent) to off-site facilities (other than public sewage treatment plants) for treatment or disposal. Together, these off-site transfers comprised 27 percent of the TRI total. (See Box 3-A and Table 3-3 for details on how off-site transfers are handled after being transferred.)

Facilities transferred 27% of the TRI total off site.

Table 3-3. TRI Transfers to Off-site Locations by Type of Treatment or Disposal, 1988

TYPE OF TREATMENT OR DISPOSAL	OFF-SITE TRANSFERS Pounds	OFF-SITE TRANSFERS Percent
LANDFILL OR OTHER DISPOSAL	378,507,589	34.27
Landfill/Surface Impoundment	275,908,221	24.98
Underground Injection	85,759,098	7.77
Other Land Disposal	16,840,270	1.52
STORAGE ONLY	16,675,642	1.51
TREATMENT	515,496,839	46.68
Incineration/Thermal Treatment	249,147,950	22.56
Wastewater Treatment (private)	114,604,368	10.38
Other Treatment	93,808,137	8.49
Solidification/Stabilization	54,956,422	4.98
Land Treatment	2,979,962	0.27
REUSE OR RECOVERY	65,648,826	5.94
Transfer to Waste Broker	42,617,215	3.86
Reuse as Fuel/Fuel Blending	22,714,105	2.06
Solvents/Organics Recovery	211,868	0.02
Other Reuse or Recovery	87,845	0.01
Metals Recovery	17,793	0.00
NOT SPECIFIC OR UNKNOWN	128,058,411	11.60
Other Off-Site Management	82,729,255	7.49
Not A Valid Code	29,578,983	2.68
Off-Site Management Unknown	15,777,173	1.43
TOTAL	1,104,414,307	100.00

WHERE TRI CHEMICAL RELEASES AND TRANSFERS ORIGINATED

Overall, 19,762 facilities filed TRI reports for 1988. Facilities reported to EPA from 53 of the 54 jurisdictions covered by TRI requirements—from all 50 states, Puerto Rico, the District of Columbia, the U.S. Virgin Islands, and American Samoa. The Commonwealth of the Northern Mariana Islands was the only jurisdiction covered by the law from which no facilities reported.

Over 19,000 facilities located in all 50 states filed TRI reports for 1988.

The majority of facilities reporting TRI releases and transfers were located in the industrial Mid-Atlantic, Midwest, and Gulf Coast states, and in California. The Rocky Mountain area, southwestern states, and northern New England had

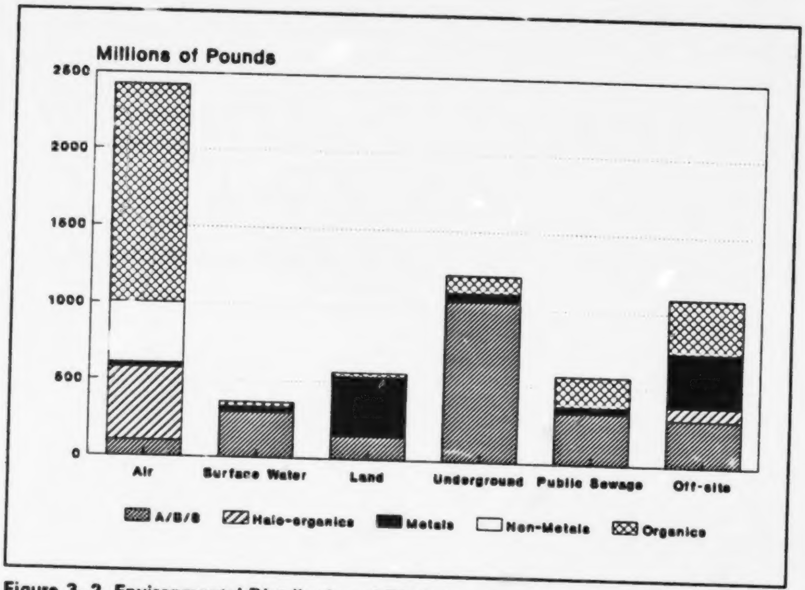


Figure 3-2. Environmental Distribution of TRI Releases and Transfers by Chemical Class, 1988 (A/B/S = Acids/Bases/Salts).

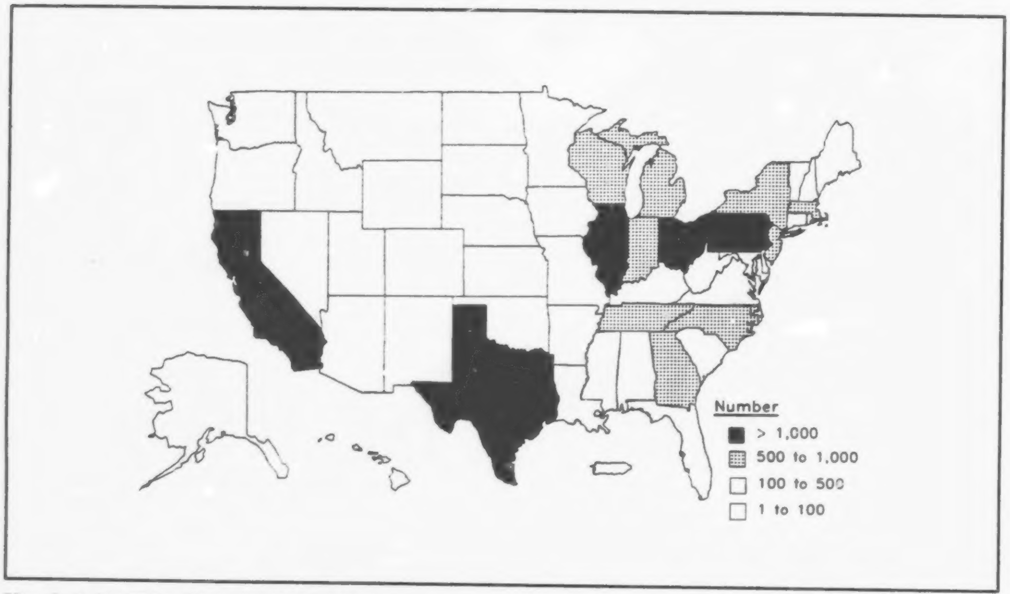
relatively few reporting facilities. California had the largest number of facilities reporting (1,655 facilities), but over 1,000 facilities reported from each of four other states—Ohio, Illinois, Texas, and Pennsylvania—as well. (See Map 3-1 and Table 3-2.)

Louisiana and Texas led the nation for TRI totals, together accounting for 24% of the national total.

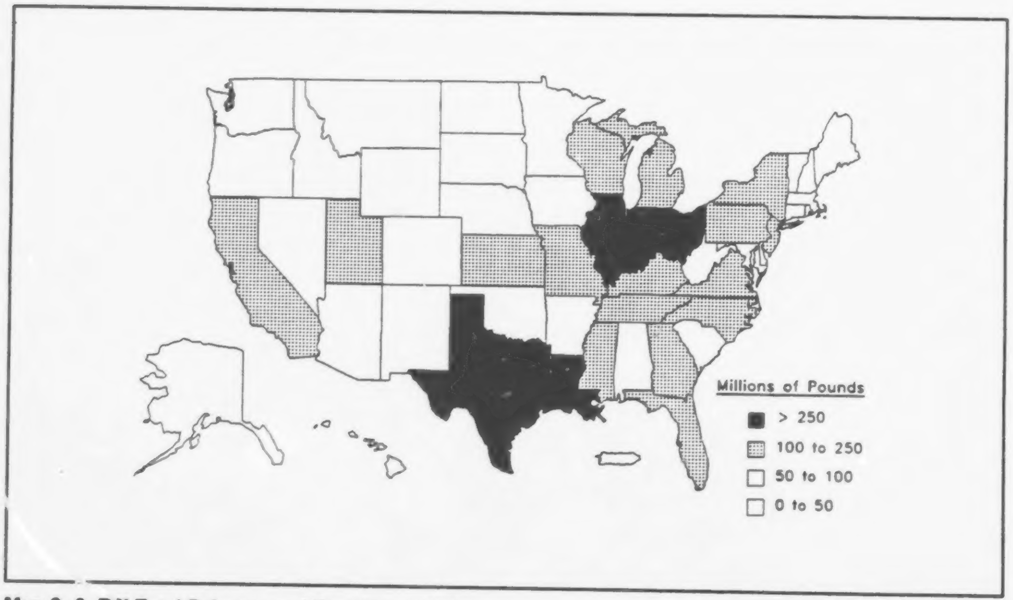
Facilities in Louisiana released and transferred 741.2 million pounds of TRI chemicals—the largest total for any state—and accounted for 12 percent of the TRI total for the nation. Texas facilities were a close second, with 724.5 million pounds. Ten states had totals greater than 200 million pounds and together accounted for over half (3.5 billion pounds) of TRI total releases and transfers in 1988. Facilities in the Gulf Coast, Great Lakes, and Mid-Atlantic states, as well as California, generally had the largest TRI releases and transfers, while smaller amounts were generated in the Rocky Mountain and Great Plains regions of the country. (See Figure 3-3 and Map 3-2.)

Louisiana had fewer TRI facilities than 25 states, yet these facilities reported larger TRI totals than those in any other state.

The number of facilities reporting is not necessarily proportional to the amount of chemicals being released to the environment. Three of the states with the largest TRI totals—Ohio, Illinois, and Texas—also had large numbers of TRI facilities, ranking second, third, and fourth, respectively, with over 1,000 facilities each. In contrast, Louisiana had the largest total releases and transfers, but ranked 26th of all states based on the number of TRI facilities (286 facilities). Thus, Louisiana


Number
■ > 1,000
▨ 500 to 1,000
☐ 100 to 500
☐ 1 to 100

Map 3-1. Facilities Reporting to TRI, 1988.


Millions of Pounds
■ > 250
▨ 100 to 250
☐ 50 to 100
☐ 0 to 50

Map 3-2. TRI Total Releases and Transfers, 1988.

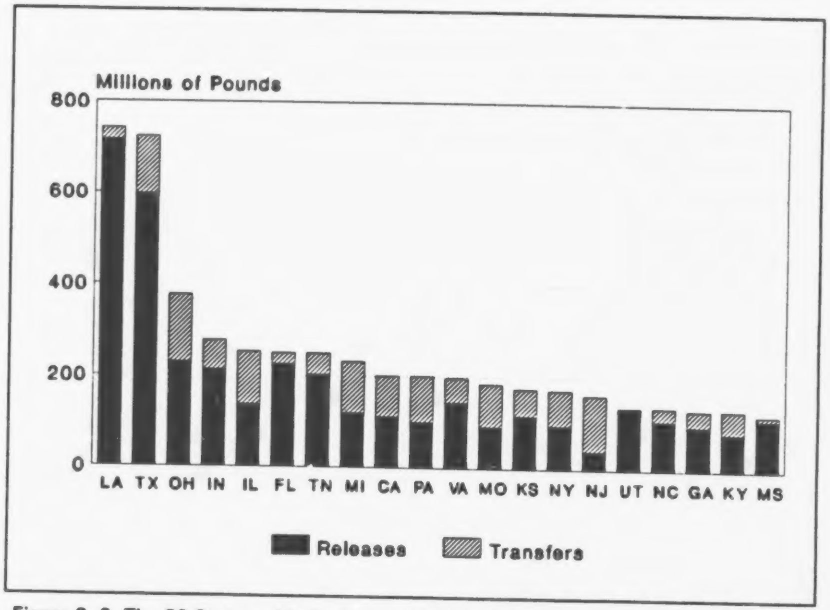


Figure 3-3. The 20 States with the Largest TRI Total Releases and Transfers, 1988.

Table 3-4. TRI Facilities and Forms by Industry, 1988.

TRI TOTAL RANK	INDUSTRY	SIC CODE	FACILITIES Number	FORMS Number	AIR Pounds	SURFACE WATER Pounds	LAND Pounds	UNDERGROUND Pounds
11	Food	20	1,452	2,649	13,716,106	3,633,426	12,454,502	1,017,909
21	Tobacco	21	19	62	13,820,462	118,812	14,751	0
15	Textiles	22	401	890	35,617,602	4,693,758	191,896	0
22	Apparel	23	29	49	1,019,201	250	40,599	0
19	Lumber	24	616	1,719	27,813,245	101,014	198,009	0
13	Furniture	25	397	1,556	56,894,704	1,850	56,511	0
4	Paper	26	587	2,328	202,210,446	86,518,400	9,925,423	0
14	Printing	27	313	623	50,423,807	35,150	316	40,000
1	Chemicals	28	3,838	20,332	754,922,471	228,105,753	164,564,318	973,706,836
9	Petroleum	29	364	3,053	54,989,933	3,471,886	3,153,767	19,846,879
7	Plastics	30	1,293	3,213	158,832,600	733,598	155,662	3,004
17	Leather	31	132	372	14,255,347	680,505	353,215	0
16	Stone/Clay	32	559	1,315	23,283,963	874,242	2,029,808	6,580,250
2	Primary Metals	33	1,380	5,446	232,958,571	18,987,700	277,003,090	41,020,432
6	Fabricated Metals	34	2,579	7,860	117,524,318	1,518,379	4,742,417	286,120
10	Machinery	35	870	2,315	51,754,691	548,021	257,368	52,800
8	Electrical	36	1,578	5,047	115,198,789	714,367	1,454,389	43,720
5	Transportation	37	1,054	4,447	201,297,144	331,889	1,256,795	21,384
12	Measure./Photo.	38	344	1,000	45,076,520	685,863	490,993	250
8	Miscellaneous	39	372	946	26,171,054	54,173	304,149	0
3	Mult. codes 20-39		1,303	5,133	217,850,529	8,547,184	80,320,516	172,724,324
20	No codes 20-39		282	776	11,938,600	1,238,018	2,588,388	0
	TOTAL		19,762	71,131	2,427,570,103	361,594,238	561,556,882	1,215,343,908

facilities released greater amounts, on average, than facilities in states such as Ohio, Illinois, and Texas.

TRI totals were largely concentrated in several dozen cities and counties around the nation. For example, facilities in 25 counties produced over one third of the national TRI total for 1988 and 42 percent of the total was concentrated in just 50 cities. These localized concentration patterns, detailed in Chapter 5, are often due to one or several dominant facilities, as described below.

Facilities in 25 counties generated 1/3 of the TRI total; 42% of the total was concentrated in 50 cities.

INDUSTRIAL DISTRIBUTION

Major Industries

The Chemical and Allied Products industry and the Primary Metals industry each generated more TRI releases and transfers than any other industries in 1988, together accounting for 60 percent of the TRI total. The Chemical industry reported 2.9 billion pounds (46 percent of the national TRI total) and the Primary Metals industry reported 857.9 million pounds (14 percent). No other industry generated more than 370 million pounds of TRI releases and transfers. The five industries with the smallest TRI totals (Apparel, Tobacco Manufacturing, Lumber and Wood Products, Miscellaneous Manufacturing, and Leather Products) together accounted for less than two percent of the TRI total. (See Table 3-4.)

Chemical manufacturers reported nearly 1/2 of all TRI releases and transfers; Primary Metals facilities reported another 14%.

Table 3-4. continued

INDUSTRY	PUBLIC SEWAGE	OFF-SITE TOTAL	TOTAL RELEASES AND TRANSFERS	
	Pounds	Pounds	Pounds	Percent
Food	39,117,332	2,962,616	72,901,891	1.17
Tobacco	791,940	312,982	15,058,947	0.24
Textiles	15,274,101	3,547,7[illegible]	59,325,071	0.95
Apparel	692,897	166,74[illegible]	1,919,695	0.03
Lumber	952,592	4,303,183	33,368,043	0.53
Furniture	390,551	5,451,673	62,795,289	1.01
Paper	39,743,943	31,944,839	370,343,051	5.93
Printing	3,460,704	6,581,949	60,541,926	0.97
Chemicals	323,874,071	438,305,845	2,883,479,294	46.20
Petroleum	13,060,813	9,713,429	104,236,707	1.67
Plastics	4,957,837	24,443,360	189,126,061	3.03
Leather	20,340,615	2,176,552	37,806,234	0.61
Stone/Clay	1,294,091	21,120,356	55,182,710	0.88
Primary Metals	19,088,232	268,808,482	857,866,507	13.75
Fabricated Metals	18,342,883	72,698,383	215,112,500	3.45
Machinery	2,993,295	19,725,887	75,332,062	1.21
Electronics	18,711,626	46,261,903	182,384,794	2.92
Transportation	7,502,020	50,770,863	261,180,095	4.18
Measure./Photo.	5,415,110	12,698,912	64,367,648	1.03
Miscellaneous	452,222	9,061,758	36,043,356	0.58
Mult. codes 20-39	30,813,971	69,259,997	579,516,521	9.29
No codes 20-39	3,280,462	4,096,876	23,142,344	0.37
TOTAL	570,551,308	1,104,414,307	6,241,030,746	100.00

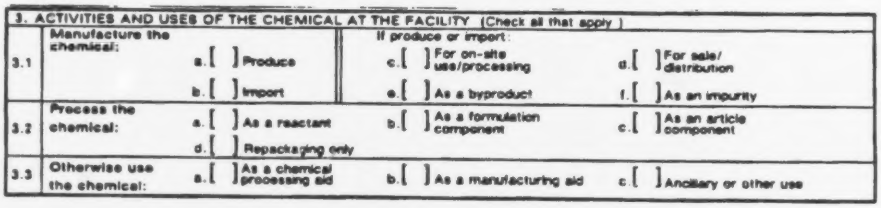
Details on industrial distribution patterns are presented in Chapter 6. Appendix C outlines the Standard Industrial Classification system used in this report and lists industries that must report under TRI.

9% of the TRI total was generated by facilities reporting more than one industrial category.

Facilities in more than one industrial category[2] accounted for 579.5 million pounds (nine percent) of total TRI releases and transfers. This group consists of diversified facilities who manufacture or process products across a range of traditional industrial sectors. For example, a facility that manufactured both photographic chemicals and photographic equipment would be listed under two SIC codes: 28 (Chemical and Allied Products) and 38 (Measuring/Photographic Equipment). Likewise, a petrochemical company that both refines petroleum and manufactures petroleum products would report under both the Chemical (SIC 28) and Petroleum Refining (SIC 29) industries.

Industrial Activities and Uses

TRI facilities were required to indicate whether the chemical is manufactured, processed or otherwise used at the facility. The TRI form contains three major categories to indicate activities and uses to be checked by facilities: **manufacture** (including production as well as importation into this country), **process** (including repackaging and use as a reactant or component of a product), and **other use** (including solvents, lubricants, and other ancillary uses such as cleaners or fuels). The manufacture category is limited to manufacture (or import) of the chemical. The chemical may be produced, for example, at a Chemical facility for sale to others. However, a Plastics manufacturer can also "manufacture" TRI chemicals as byproducts, or as inputs needed in the manufacture of the plastics. In this case, the Plastics facility would most likely report a combination of uses for the chemical. (See Figure 3-4.)



3. ACTIVITIES AND USES OF THE CHEMICAL AT THE FACILITY (Check all that apply)				
3.1	Manufacture the chemical:	a. [ ] Produce b. [ ] Import	If produce or import: c. [ ] For on-site use/processing e. [ ] As a byproduct	d. [ ] For sale/ distribution f. [ ] As an impurity
3.2	Process the chemical:	a. [ ] As a reactant d. [ ] Repackaging only	b. [ ] As a formulation component	c. [ ] As an article component
3.3	Otherwise use the chemical:	a. [ ] As a chemical processing aid	b. [ ] As a manufacturing aid	c. [ ] Ancillary or other use

Figure 3-4. Industrial Activities and Uses Section of the 1988 TRI Form R.

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(2) Facilities were permitted to file under more than one Standard Industrial Classification (SIC) code. Facilities with more than one major (two-digit SIC) industry classification are categorized as "Multiple" in this report. See Appendix C for a list of the industries (by SIC code) that are required to report under TRI.

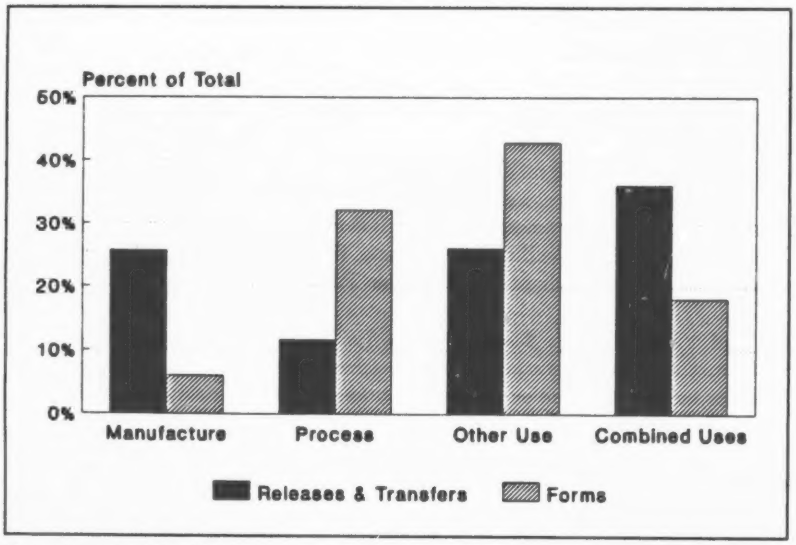

Figure 3-5. TRI Total Releases and Transfers by Industrial Activities and Uses, 1988. (Activities and Uses were not Reported on 0.6% of all Forms—0.3% of the TRI Total.)

Facilities that reported *manufacturing* as their sole activity for a chemical comprised fewer than one percent of all TRI facilities and submitted six percent of the total number of forms, but generated 26 percent (1.6 billion pounds) of the 1988 TRI total. In other words, chemicals only manufactured (and not otherwise processed or used) at a facility had relatively high releases and transfers associated with them. (See Figure 3-5.)

Manufacture-only facilities generated 26% of the TRI total.

The 20 percent of TRI facilities that reported *processing only* for a chemical submitted 32 percent of all TRI forms that reported releases or transfers but accounted for only 12 percent of the total releases and transfers. Thus, the TRI chemical wastes generated during processing are lower, on average, than those reported on forms for manufacturing. Likewise, the 38 percent of facilities that reported *other uses only* for a chemical submitted the largest portion of forms (43 percent) but accounted for only 26 percent of the total TRI releases and transfers. *Combined uses* were reported on 18 percent of all TRI forms and accounted for 36 percent of all releases and transfers. Thus, facilities engaged in either only chemical processing or only other chemical uses report relatively low releases and transfers, while facilities using chemicals in a combination of ways report relatively high releases or transfers.

Processing and other uses generated relatively smaller amounts of TRI wastes per form.

TRI FACILITIES

Just 50 individual facilities were responsible for over 1/3 of all TRI releases and transfers.

The overall patterns of geographical and industrial distribution described above are heavily influenced by a small number of individual facilities reporting TRI amounts that are larger by an order of magnitude (or more) than the releases and transfers from most other TRI facilities. The 50 facilities alone were responsible for 2.3 billion pounds of TRI releases and transfers—36 percent of the nationwide total. Five facilities reported amounts of over 100 million pounds each, and 11 more reported more than 50 million pounds each. Four of these major facilities are located in Louisiana and three in Texas. (See Table 3-5.)

Releases and transfers from these top facilities affect every geographical, industrial, and chemical analysis presented throughout this report. The enormous role played by individual facilities suggests that the most telling analyses of TRI data will be those that focus on specific aspects of the data and that examine the data at the facility level. This facility focus is carried out frequently in this report, although the scope of the analysis herein—national summary statistics—sometimes precludes that level of detail.

3 facilities in 3 states were responsible for nearly 25% of the nationwide total for land disposal of TRI chemicals.

For some types of TRI releases, individual states played a large role, often because of one or a few facilities. For example, land disposal in Florida, Indiana, and Arizona comprised 36 percent of the total TRI on-site land releases (199.4 million pounds out of 561.6 million). These three states house the three facilities with the largest land disposal (each over 30 million pounds): Inland Steel Co. (East Chicago, Indiana), Occidental Chemical Corp. (White Springs, Florida), and Asarco Inc. (Hayden, Arizona). Together, these three facilities disposed of 132.7 million pounds of TRI chemicals on land—an amount that represents two thirds of the total for the three states, and 24 percent of the total land disposal nationwide. (See Table 3-6.)

Similarly, Louisiana facilities discharged more TRI chemicals to underground wells (423.3 million pounds) than any other state, releasing over one third of total TRI underground well discharges nationwide[3] and discharged more TRI chemicals to surface water (157.3 million pounds) than any other state, representing 44 percent of total surface water releases. Ohio and Michigan manufacturers reported more off-site transfers (to facilities other than public sewage treatment plants) than any other states, accounting for 20 percent of such off-site transfers. The connections between major facilities and top states will be discussed in more detail in subsequent chapters.

(3) Facilities in many Midwestern and Western states and New England did not report any underground injection; many states do not have the appropriate geological conditions to support this method of chemical waste disposal.

Table 3-5. The 50 TRI Facilities with the Largest Total Releases and Transfers 1988.

TRI RANK	FACILITY NAME	SIC CODE	CITY	COUNTY	STATE	TRI TOTAL RELEASES AND TRANSFERS
1	American Cyanamid Co.	28	Westwego	Jefferson	LA	176,418,250
2	Shell Oil Co. - Norco Mfg. Complex	Mult	Multorco	St Charles	LA	158,662,990
3	Du Pont Beaumont Works	28	Beaumont	Jefferson	TX	111,899,929
4	Amax Magnesium	33	Ooele	Tooele	UT	109,750,090
5	Monsanto Co.	28	Alvin	Brazoria	TX	103,333,180
6	Vulcan Chemicals	28	Wichita	Sedgwick	KS	92,011,960
7	BP Chemicals Green Lake	28	Ort Lavaca	Calhoun	TX	78,225,900
8	Agrico Chemical Co. Div. - Freeport McMoran	28	Uncle Sam	St James	LA	63,327,150
9	Freeport Mcmoran - Agrico Chemical Co. Div.	28	Donaldsonville	St James	LA	61,820,000
10	Inland Steel Co.	Mult	East Chicago	Lake	IN	61,364,500
11	BP Chemicals Inc.	28	Lima	Allen	OH	57,746,450
12	ITT Rayonier Inc.	26	Fernandina Beach	Nassau	FL	54,369,100
13	Du Pont Johnsonville Plant	28	New Johnsonville	Humphreys	TN	52,691,910
14	Columbian Chemicals Co.	28	Saint Louis	St Louis	MO	52,477,645
15	Racon Inc.	28	Wichita	Sedgwick	KS	51,215,854
16	Occidental Chemical Corp.	28	White Springs	Hamilton	FL	50,342,021
17	Du Pont Delisle Plant	28	Pass Christian	Harrison	MS	49,061,860
18	Allied-Signal Inc.	28	Hopewell	Hopewell City	VA	44,758,492
19	Sterling Chemicals Inc.	28	Texas City	Galveston	TX	42,999,850
20	Tennessee Eastman Co.	28	Kingsport	Sullivan	TN	42,699,939
21	Avtex Fibers Front Royal Inc.	28	Front Royal	Warren	VA	37,731,700
22	BASF Corp.	28	Geismar	Ascension	LA	37,264,998
23	Monsanto Co.	28	Cantonment	Escambia	FL	36,249,190
24	Asarco Inc.	33	Hayden	Gila	AZ	35,930,150
25	Arcadian Corp.	28	Geismar	Ascension	LA	35,655,500
26	Asarco Inc.	33	East Helena	Lewis & Clark	MT	32,968,162
27	Du Pont Louisville Works	28	Louisville	Jefferson	KY	31,305,496
28	National Steel	33	Ecorse	Wayne	MI	29,841,133
29	Midwest Steel Corp.	33	Portage	Porter	IN	29,404,715
30	Herculaneum Smelter	33	Herculaneum	Jefferson	MO	28,890,351
31	Allied-signal Inc.	28	Elizabeth	Union	NJ	28,290,620
32	Wycon Chemical Co.	28	Cheyenne	Laramie	WY	28,135,426
33	Triad Chemical	28	Donaldsonville	Ascension	LA	27,666,682
34	Monsanto Co.	28	Cahokia	St Clair	IL	26,346,278
35	Filtrol Corp.	28	Vernon	Los Angeles	CA	23,533,250
36	Phelps Dodge Mining Co.	33	Playas	Hidalgo	NM	22,836,754
37	Eastman Kodak Co.	38	Rochester	Monroe	NY	22,578,939
38	Unocal Chemicals Div.	28	Kenai	Kenai Peninsula	AK	20,822,000
39	Ciba-Geigy Corp.	28	Queensbury	Warren	NY	20,237,150
40	Conserv Inc.	28	Nichols	Polk	FL	19,913,993
41	Du Pont Victoria Site	28	Victoria	Victoria	TX	19,305,153
42	Upjohn Co.	28	Kalamazoo	Kalamazoo	MI	18,302,800
43	Air Products & Chemicals Inc.	28	Pasadena	Harris	TX	17,297,340
44	BASF Corp. - Fibers Div.	28	Lowland	Hamblen	TN	17,215,000
45	Cyprus Miami Mining Corp.	33	Claypool	Gila	AZ	16,938,022
46	Pfizer Pigments Inc.	28	East Saint Louis	St Clair	IL	16,760,052
47	3M Mag Media & Consumer Products	36	Hutchinson	Mc Leod	MN	16,645,979
48	Logan Aluminum	33	Russellville	Logan	KY	16,408,569
49	Union Camp Corp.	Mult	Savannah	Chatham	GA	16,357,150
50	SCM Chemicals Inc.	28	Ashtabula	Ashtabula	OH	15,889,750
	SUBTOTAL					2,261,899,372
	PERCENT OF GRAND TOTAL					36.24
	TOTAL FOR ALL OTHERS					3,979,131,374
	GRAND TOTAL					6,241,030,746

Box 3-C shows how corrections to the database affect releases from these facilities.

Table 3-6. The Top 5 TRI Facilities for Each Environmental Medium, 1988.

RANK	SIC CODE	FACILITY NAME	CITY	COUNTY	STATE	RELEASE OR TRANSFER	
						Pounds	Percent
		AIR EMISSIONS					
1	33	Amax Magnesium	Tooele	Tooele	UT	109,748,910	4.52
2	28	Tennessee Eastman Co.	Kingsport	Sullivan	TN	40,153,450	1.65
3	28	Avtex Fibers Front Royal Inc.	Front Royal	Warren	VA	34,410,250	1.42
4	28	Triad Chemical	Donaldsonville	Ascension	LA	27,140,610	1.12
5	38	Eastman Kodak Co.	Rochester	Monroe	NY	21,621,312	0.89
		SUBTOTAL				233,074,532	9.60
		TOTAL FOR ALL OTHERS				2,194,495,571	90.40
		GRAND TOTAL FOR AIR EMISSIONS				2,427,570,103	100
		SURFACE WATER DISCHARGES					
1	28	Agrico Chem. Co. Div. - Freeport-McMoran	Uncle Sam	St James	LA	62,675,000	17.33
2*	26	ITT Rayonier Inc.	Fernandina Beach	Nassau	FL	54,021,100	14.94
3	28	Freeport McMoran - Agrico Chem. Co. Div.	Donaldsonville	St James	LA	47,299,000	13.08
4	28	Arcadian Corp.	Geismar	Ascension	LA	32,980,250	9.12
5	28	Allied-Signal Inc.	Hopewell	Hopewell City	VA	18,930,647	5.24
		SUBTOTAL				215,905,997	59.71
		TOTAL FOR ALL OTHERS				145,688,241	40.29
		GRAND TOTAL FOR SURFACE WATER				361,594,238	100
		ON-SITE LAND DISPOSAL					
1	Mult	Inland Steel Co.	East Chicago	Lake	IN	50,040,600	8.91
2	28	Occidental Chemical Corp.	White Springs	Hamilton	FL	49,000,000	8.73
3	33	Asarco Inc.	Hayden	Gila	AZ	33,663,950	5.99
4	33	Asarco Inc.	East Helena	Lewis and Clark	MT	32,764,230	5.83
5	33	Herculaneum Smelter	Herculaneum	Jefferson	MO	28,460,108	5.07
		SUBTOTAL				193,928,888	34.53
		TOTAL FOR ALL OTHERS				367,627,994	65.47
		GRAND TOTAL FOR ON-SITE LAND DISPOSAL				561,556,882	100
		UNDERGROUND INJECTION					
1	28	American Cyanamid Co.	Westwego	Jefferson	LA	175,187,750	14.41
2	Mult	Shell Oil Co. - Norco Mfg. Complex	Norco	St Charles	LA	156,363,300	12.87
3*	28	Du Pont Beaumont Works	Beaumont	Jefferson	TX	108,145,660	8.90
4*	28	Monsanto Co.	Alvin	Brazoria	TX	102,787,500	8.46
5	28	Vulcan Chemicals	Wichita	Sedgwick	KS	90,744,910	7.47
		SUBTOTAL				633,229,120	52.11
		TOTAL FOR ALL OTHERS				582,114,788	47.89
		GRAND TOTAL FOR UNDERGROUND INJECTION				1,215,343,908	100
		TRANSFERS TO PUBLIC SEWAGE					
1	28	Columbian Chemicals Co.	Saint Louis	St Louis	MO	52,378,727	9.18
2	28	Allied-Signal Inc.	Hopewell	Hopewell City	VA	25,339,614	4.44
3	28	Filtrol Corp.	Vernon	Los Angeles	CA	23,500,000	4.12
4	28	Monsanto Co.	Cahokia	St Clair	IL	22,239,640	3.90
5	28	Air Products & Chemicals Inc.	Pasadena	Harris	TX	16,985,850	2.98
		SUBTOTAL				140,443,831	24.62
		TOTAL FOR ALL OTHERS				430,107,477	75.38
		GRAND TOTAL FOR PUBLIC SEWAGE				570,551,308	100
		OFF-SITE TRANSFERS					
1	28	Racon Inc.	Wichita	Sedgwick	KS	51,117,901	4.63
2	28	Allied-Signal Inc.	Elizabeth	Union	NJ	28,200,000	2.55
3	33	National Steel	Ecorse	Wayne	MI	27,644,813	2.50
4	28	Ciba-Geigy Corp.	Queensbury	Warren	NY	17,345,100	1.57
5	33	Logan Aluminum	Russellville	Logan	KY	16,217,245	1.47
		SUBTOTAL				140,525,059	12.72
		TOTAL FOR ALL OTHERS				963,889,248	87.28
		GRAND TOTAL FOR OFF-SITE TRANSFERS				1,104,414,307	100

* Box 3-C shows how corrections to the database affect releases from these facilities.

RELEASES AND TRANSFERS GOVERNED BY EPA REGULATIONS

TRI is a *reporting* requirement only; it does not actually *regulate* chemical discharges. Many TRI chemicals and TRI facilities are *regulated* under environmental laws including the Clean Air Act, the Clean Water Act, and the Resource Conservation and Recovery Act (RCRA).

Air Emissions of Chemicals Regulated Under NESHAPs

Nine TRI chemicals and chemical categories[4] are regulated under EPA's National Emissions Standards for Hazardous Air Pollutants (NESHAP), developed under the Clean Air Act. EPA sets these emissions standards for certain air pollutants that may pose serious human health hazards, but are not covered by the National Ambient Air Quality Standards. Emissions of these NESHAP chemicals accounted for one percent of the total TRI air emissions. Few facilities report using and/or releasing these chemicals. Only 471 facilities reported benzene, and the other NESHAP chemicals were each reported by fewer than 250 facilities. Benzene accounted for the largest total air emissions (28.3 million pounds, or 94 percent of the 1988 subtotal for NESHAP chemicals). Note, however, that industry is only one source—and probably not the most important one—of benzene emissions to the atmosphere. Benzene is also a component of gasoline, and is emitted with escaping fumes at gas pumps, as well as in auto emissions. (See Table 3-7.)

Air emissions of NESHAP chemicals formed 1% of the 1988 total TRI air emissions.

Air Toxics

The new Clean Air Act under consideration in Congress calls for EPA to regulate 191 air toxic chemicals, 171 of which are on the TRI list. These 171 chemicals accounted for 81 percent (2.0 billion pounds) of total TRI emissions to air in 1988. Eight of the chemicals—toluene, ammonia, methanol, 1,1,1-trichloroethane, xylene, chlorine, methyl ethyl ketone, and dichloromethane—were each emitted into the air in amounts exceeding 100 million pounds in 1988, accounting for 71 percent of total air emissions of the 171 air toxic chemicals. No air emissions were reported for 21 of the air toxic chemicals. As EPA develops and imposes the regulations mandated by the new legislation, TRI data will be a useful tool to monitor changes in air emissions of these chemicals and to measure the impact of the new regulations. (See Appendix B for a list of the chemicals

(4) The six NESHAP chemicals covered by TRI are benzene, asbestos, arsenic, vinyl chloride, beryllium, and mercury. Three of the six—arsenic, beryllium, and mercury—may also be reported as TRI chemical categories. Thus, six NESHAPs chemicals are represented by nine different TRI chemicals and chemical categories.

Table 3-7. TRI Air Emissions of NESHAP* Air Pollutants, 1988.

NESHAP CHEMICALS	TRI FORMS Number	POINT SOURCE Pounds	FUGITIVE Pounds	TOTAL AIR Pounds	TRI TOTAL RELEASES AND TRANSFERS Pounds	AIR EMISSIONS AS PERCENT OF TRI TOTAL
BENZENE	471	10,058,775	18,229,914	28,288,689	33,245,252	85.09
ASBESTOS (FRIABLE)	131	33,768	8,532	42,300	22,607,674	0.19
ARSENIC COUMPOUNDS	243	160,941	41,111	202,052	7,020,945	2.88
VINYL CHLORIDE	46	995,356	392,474	1,387,830	2,072,382	66.97
MERCURY	34	7,229	15,784	23,013	296,679	7.76
ARSENIC	72	4,579	3,108	7,687	238,229	3.23
BERYLLIUM	11	2,463	1,300	3,763	44,249	8.50
MERCURY COMPOUNDS	15	1,365	1,001	2,366	21,526	10.99
BERYLLIUM COMPOUNDS	6	861	1	862	21,423	4.02
SUBTOTAL	1,029	11,265,337	18,693,225	29,958,562	65,568,359	45.69
TOTAL FOR ALL OTHERS	70,102	1,679,710,716	717,900,825	2,397,611,541	6,175,462,387	38.82
GRAND TOTAL	71,131	1,690,976,053	736,594,050	2,427,570,103	6,241,030,746	38.90

* National Emissions Standards for Hazardous Air Pollutants

covered by air toxics legislation and Appendix D, Table D-1 which contains air emissions data for those chemicals.)

Discharges to Surface Water Covered by NPDES Regulations

Discharges Reported with NPDES Numbers

More than 99% of all discharges to surface water are from facilities with a NPDES permits.

Most TRI chemical forms reporting surface water discharges (6,957 out of 7,608 forms, or 91 percent) listed discharges along with a permit under the National Pollutant Discharge Elimination System (NPDES).[5] NPDES permits are issued to individual facilities under the authority of the Clean Water Act by EPA or state environmental agencies to control discharges of chemicals to surface waters. Facilities that reported NPDES numbers discharged 357.4 million pounds to surface waters, which constitute 99 percent of all such discharges. The remaining 4.2 million pounds (one percent) of chemical discharges to surface waters were reported on the 651 forms (nine percent of forms) that did not include NPDES permit numbers. To determine whether the amounts reported by a facility complied with the allowed level, Federal and State authorities could compare TRI data with the issued permit. The NPDES permit numbers contained in TRI should facilitate the comparison. (See Table 3-8.)

(5) The permit numbers on 427 forms (six percent) of these forms, however, may be invalid because they did not conform to the usual format for NPDES permit numbers. These 427 forms accounted for six percent (13.4 million pounds) of direct releases to surface waters.

Discharges of Priority Pollutants

NPDES permits limit over 1,500 types of pollutants. A subset of these contaminants (126) have been designated as priority pollutants. These toxic chemicals are controlled in permits according to technology-based standards set for individual industrial categories. Of the TRI chemicals and chemical categories, 94 are also priority pollutants. TRI facilities reported discharging a total of 22.4 million pounds of 78 priority pollutants in 1988, or six percent of the total TRI surface water discharges. Methanol accounted for 74 percent (16.6 million pounds) of the surface water discharges of the priority pollutants; no releases were reported for 12. (See Table 3-9. Also, Appendix D, Table D-2 lists the total discharges to surface water of each priority pollutant.)

Priority pollutants comprised 6% of the 1988 TRI discharges to surface water.

Land Disposal and Off-Site Transfers Covered by RCRA Regulations

EPA assigns identification numbers to every waste-generating or handling facility regulated under the Resource Conservation and Recovery Act (RCRA) for land disposal of chemicals. Of the 3,922 TRI forms that described on-site land disposal, 90 percent (3,541 forms) listed a RCRA identification number. [6] These forms reported on-site land disposal of 547.3 million pounds of TRI chemicals—97 percent of the on-site land total. The remaining 14.2 million pounds (three percent) of on-site land releases were reported on 381 forms (ten percent of forms) without a RCRA identification number. (See Table 3-9.)

Over 95% of the TRI on-site land disposed were covered by RCRA permits.

Table 3-8. TRI Facilities Reporting Surface Water Discharges with NPDES* Permit Numbers, 1988.

	FACILITIES		FORMS		SURFACE WATER DISCHARGES	
	Number	Percent	Number	Percent	Pounds	Percent
FORMS WITH NPDES PERMIT NO.	2,041	86.52	6,957	91.44	357,378,456	98.83
FORMS WITHOUT NPDES PERMIT NO.	318	13.48	651	8.56	4,215,782	1.17
TOTAL	2,359	100.00	7,608	100.00	361,594,238	100.00

* National Pollutant Discharge Elimination System

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(6) The identification numbers on 247 forms (six percent) of these forms, however, may be invalid because they did not conform to the usual format for RCRA identification numbers. These 247 forms accounted for six percent (64.1 million pounds) of on-site land releases.

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Table 3-9. TRI Facilities Reporting RCRA* Identification Numbers, 1988.

	ON-SITE LAND DISPOSAL				OFF-SITE TRANSFERS			
	FORMS		RELEASES		FORMS		TRANSFERS	
	Number	Percent	Pounds	Percent	Number	Percent	Pounds	Percent
FORMS WITH RCRA ID	3,541	90.29	547,319,945	97.46	26,232	96.48	1,084,559,325	98.20
FORMS WITHOUT RCRA ID	381	9.71	14,236,937	2.54	958	3.52	19,854,982	1.80
TOTAL	3,922	100.00	561,556,882	100.00	27,190	100.00	1,104,414,307	100.00

* Resource Conservation and Recovery Act

98% of off-site transfers were covered by RCRA permits.

RCRA regulations also cover the transfer of wastes off-site (other than to public sewage treatment plants), requiring that off-site transfers be accompanied by a manifest for tracking purposes, and that they be shipped to permitted **treatment, storage**, or **disposal facilities** only. Of the 27,190 TRI forms reporting off-site transfers, 96 percent (26,232) listed a RCRA identification number.[7] Facilities that reported a RCRA identification number transferred 1.1 billion pounds of TRI chemicals off-site (98 percent of off-site transfers). The remaining 19.9 million pounds (two percent) of off-site transfers were reported on 958 forms (four percent of forms) without a RCRA identification number. Again, further analysis of TRI data could reveal whether the chemicals for which the transfers were reported without RCRA numbers violate RCRA standards. (See Table 3-9.)

Many, but not all, TRI chemicals are considered hazardous wastes under RCRA; further analysis could be conducted to determine whether the amounts reported without RCRA numbers are composed of chemicals not covered by RCRA regulations and whether these releases violate RCRA standards. In addition, Chapters 8 and 10 review the changes in TRI land disposal and off-site transfers data, and suggest how some these changes might be linked to RCRA regulations.

HOW FACILITIES ESTIMATED TRI RELEASES AND TRANSFERS

TRI regulations require that facilities report chemical releases and transfers to the extent that data are available or reasonably ascertainable, and to indicate how they arrive at the reported amounts. Actual measurements are to be used if available. Otherwise, facilities are to provide data based on estimates or calcula-

(7) The identification numbers on 1,157 forms (four percent) of these forms, however, may be invalid because they did not conform to the usual format for RCRA identification numbers. These 1,157 forms accounted for four percent (39.8 million pounds) of off-site transfers.

tion. If more than one method is used to arrive at the reported amount, facilities are to report the principal method by which the amount is derived.

32% of TRI releases and transfers were based on measurements.

The largest portion of the TRI data (2.3 billion pounds, or 37 percent) was based on "other" approaches such as engineering calculations or best engineering judgement. Another 32 percent (2.0 billion pounds) was based on **monitoring data or measurements**, 22 percent (1.4 billion pounds) was based on **mass balance calculations**, and a small fraction (259.4 million pounds, or 4 percent) was based on published **emission factors**. Reporting methods for the remaining five percent were not indicated. (See Figure 3-6.)

Facilities' accuracy in estimating their releases varies greatly both within and between the different estimation methods. For example, *measurements* may seem to be the most accurate basis for reporting release and transfer amounts, but if they are performed for only a part of the year, with the amounts being extrapolated to the full year, the accuracy may be reduced. Furthermore, even within each general estimation method, facilities may develop widely varying estimates according to available data and expertise. The issue of data quality is discussed in more detail below.

Different methods prevailed in different environmental forms of releases. For instance, 44 percent of all discharges to surface water were directly measured,

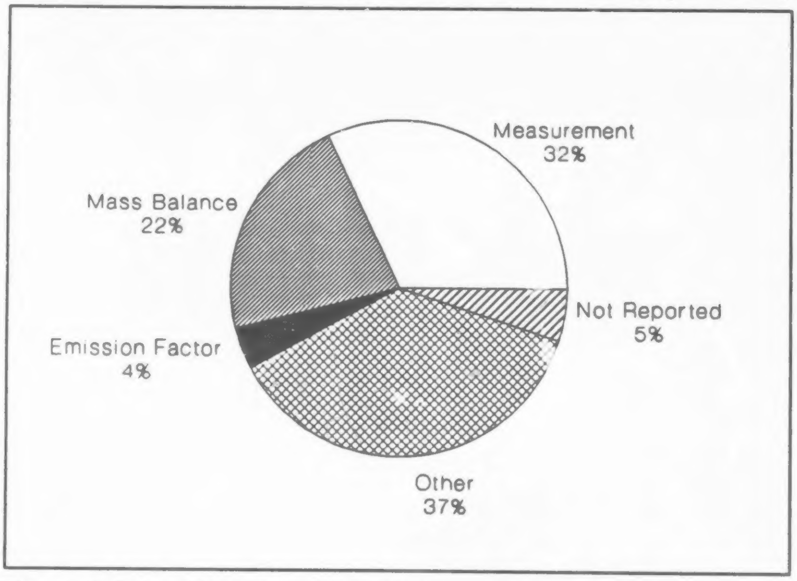

Figure 3-6. Basis of Estimate for TRI Total Releases and Transfers, 1988.

while only 12 percent of air emissions were measured. The largest share of air emissions was based on "other" approaches (43 percent). The largest share of releases to underground wells was also based on measurement (52 percent). Estimates of on-site land disposal were divided between measurement (40 percent) and "other" approaches (40 percent). Off-site transfers were largely based on measurements (48 percent). Transfers to public sewage plants were primarily based on calculations (37 percent) and "other" approaches (35 percent). (See Figure 3-7.)

Such differences are likely to arise from the fact that certain releases, such as releases to surface water and land, are more readily contained and collected for measurement, while others, such as air emissions, are more dispersed, uncontained, and difficult to measure. Also, regulatory controls can play a role. For example, public sewage treatment plants to which the wastes are transferred may not require detailed monitoring while most permits to discharge to surface waters do. Facilities are also more likely to know the amount of wastes that must be physically transported off of the site (off-site transfers), because shipments by barrel, rail, or truck have a built in source for estimates.

TRI DATA QUALITY

TRI facilities report release and transfer data to the best of their ability based on information readily available at the facility. Such information may include

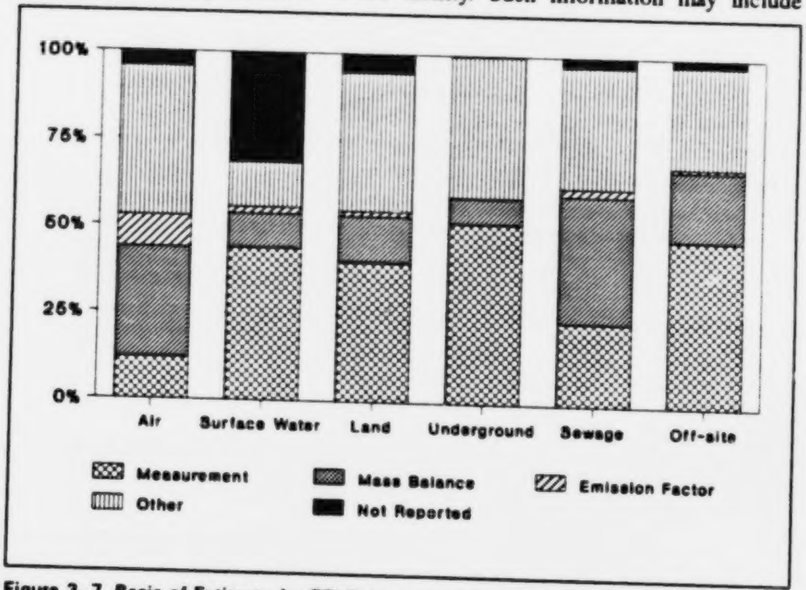

Figure 3-7. Basis of Estimate for TRI Releases and Transfers, 1988: Environmental Distribution.

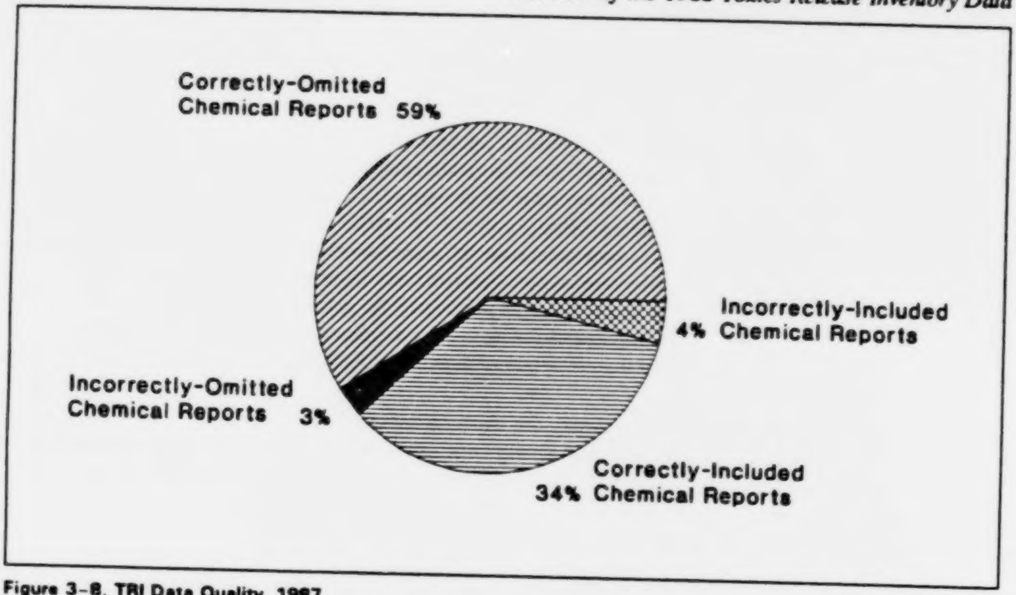

Figure 3-8. TRI Data Quality, 1987.
(Source: "Assessment of Data Quality in the 1987 Toxics Release Inventory: Site Visit Program," March 27, 1990. Prepared for EPA by Radian Corp.)

monitoring data, chemical analyses, weights of raw materials or waste shipments, flow volumes, changes in fluid levels, changes in pressure, and so on. Facilities can also estimate releases based on known physical properties such as vapor pressure — the ease with which a fluid evaporates — or from published "emissions factors" which give typical releases from fairly standard industrial operations. As a last resort, facility personnel may rely on "professional judgement" in the absence of precise numerical information on which to base an estimate.

How good are the TRI data? To begin to address this question, EPA conducted an extensive analysis, through site visits, of data estimation techniques used at 158 facilities who submitted a total of 728 TRI reports for 1987. The sample of facilities was chosen to represent the broad universe of TRI reporters, and to give a statistically valid view of data quality. For instance, the site teams visited more chemical plants than facilities from any other industry, since the chemical industry accounted for more TRI reports and releases than any other. The survey only examined facilities that actually reported to TRI in 1987; a separate survey was conducted to determine the extent to which facilities that should have reported failed to do so. The results of that non-reporter survey are discussed below.

One important caveat about the data quality analyses: in many cases it is impossible to be certain that TRI release data is an accurate reflection of the actual volume of releases. The best that EPA's site visit teams could do, in many instances, was to assess whether facilities did or did not use the best known estimation techniques. However, the site visits did not attempt to evaluate whether the estimation techniques themselves provided accurate data on TRI releases.

Site surveys found aggregated TRI data to be surprisingly accurate.

All told, the TRI data were found to be surprisingly accurate *in the aggregate*. The total volume of reported TRI releases and transfers was just two percent lower than the corrected figures arrived at by the site visit teams. National totals for air releases, water discharges, and so on are generally within plus or minus ten percent of the corrected data estimates. Almost 80 percent of all release estimates were found to be without an error. However, the apparent accuracy of the data is, in part, due to the fact that the 20 percent of the release and transfer data that were in error—overestimates and underestimates, along with incorrect omissions and submissions—had the net effect of cancelling each other out.

When examined in more detail, the site visit data provides a fuller picture of TRI data quality. For instance, the survey concluded that most facilities made correct determinations about whether they needed to report a given chemical or not. However, four percent of the forms were submitted by facilities that thought they must report a given chemical but were, in fact, not required to do so (because, for example, they were below the reporting threshold for that chemical). Conversely, three percent of TRI forms were not submitted because facilities made a self-determination that reporting was not necessary when, in fact, it was. (The percents are based on the number of *determinations* facilities made as to whether they did or did not have to report a given chemical; this number is considerably larger than the actual number of reports that facilities filed). The net result was that facilities included about 8,000 TRI reports that did not have to be submitted, and neglected to submit 6,000 reports that were required by TRI regulations. (See Figure 3-8.)

Even when facilities correctly determined that a chemical should or should not be reported, it was still possible to mistakenly report a given release. The mistake could take the form of an incorrect release estimate, reporting a release that was not actually taking place, or neglecting to report a release that was taking place. These last sorts of errors were much more common. (See Tables 3-10 and 3-11.)

16% of the "non-zero" numbers had large errors.

Of the 103,000 non-zero release (and transfer) numbers in the 1987 data base, 16,000 (16 percent) had large magnitude errors, which were defined in the study as (a) release estimates that were off by more than a factor of ten, or (b) releases that were reported when they should not have been (that is, either the true amount was zero, or the reported release were actually exempt from TRI requirements). Water discharges to surface waters or to public sewage treatment plants had higher than average error rates of 37 percent and 33 percent, respectively, and on-site land releases were also subject to frequent error (36 percent). Non-zero point source air emissions had the lowest overall error rate of seven percent. The majority of the non-zero errors were of the second type—TRI submissions that were reported when they should not have been.

Table 3-10. Frequency of Errors in Non-Release Estimates for Each Release Category.

TYPE OF RELEASE	NON-ZERO RELEASES REPORTED	NON-ZERO RELEASES WITH A LARGE ERROR	
	Number	Number	Percent
FUGITIVE AIR EMISSIONS	29,000	3,800	13.10
POINT SOURCE AIR EMISSIONS	33,000	2,200	6.67
SURFACE WATER DICHARGES	3,500	1,300	37.14
UNDERGROUND INJECTION	450	66	14.67
LAND DISPOSAL	2,200	790	35.90
TRANSFERS TO PUBLIC SEWAGE	13,000	4,300	33.07
OFF-SITE TRANSFERS	22,000	3,700	16.92
TOTAL	103,000	16,000	15.53

SOURCE: Assessment of Data Quality in the 1987 Toxics Release Inventory: Site Visit Program (prepared for the U.S. Enviromental Protection Agency by Radian Corporation, 27 March 1990).

Table 3-11. Frequency of Errors in Zero Release Estimates for Each Release Category.*

TYPE OF RELEASE	CHEMICAL RELEASE	CHEMICALS ERRONEOUSLY OMITTED FROM 1987 TRI	
	Number	Number	Percent
FUGITIVE AIR EMISSIONS	30,000	4,200	14.00
POINT SOURCE AIR EMISSIONS	25,000	3,900	15.60
SURFACE WATER DICHARGES	58,000	400	0.69
UNDERGROUND INJECTION	62,000	0	0.00
LAND DISPOSAL	60,000	300	0.50
TRANSFERS TO PUBLIC SEWAGE	47,000	1,600	3.40
OFF-SITE TRANSFERS	35,000	4,000	11.43
TOTAL	317,000	14,400	4.54

*Number of zero chemical releases was based on 60,000 correctly-included chemical reports in the 1987 tri data

Source: Assessment of Data Quality in the 1987 Toxics Release Inventory: Site Visit Program (prepared for the U.S. Environmental Protection Agency by Radian Corporation, 27 March 1990).

Of the 317,000 release numbers reported as zero, five percent were found to be in error; that is, 14,400 "zero" releases should have been reported as a positive number. Here, the patterns of errors were somewhat reversed from the non-zero reports: water discharges (surface, public sewage treatment plants and underground injection) and on-site land releases had very low error rates. The highest incidence of erroneously omitting releases occurred with air emissions; a 14 percent error rate for fugitive emissions and 16 percent for point source emissions.

5% of "zero" numbers were in error, and should have been a positive number

In general, large-quantity emitters (those in the 90th percentile for a particular type of release) had significantly fewer errors than did smaller-quantity emitters. Similarly, chemical industry facilities had a lower error rate than did non-chemical facilities.

Overall, the net effect of the errors in TRI reporting was an almost perfect cancellation of over- and underestimates, incorrect omissions and submissions. Nevertheless, the TRI system will benefit from improved data quality. The TRI form and instructions, as well as supporting documents prepared by EPA, have all been modified to enhance data quality. As industries become more familiar with TRI reporting, EPA expects data quality to continually improve, and will continue to evaluate data quality, and to take steps to improve the TRI system.

COMPLIANCE WITH TRI REQUIREMENTS

There are almost 150,000 manufacturing facilities nationwide with ten or more employees. Most of these facilities need not file TRI reports since they do not meet all of the reporting requirements. Only facilities that manufacture or use TRI chemicals in amounts that exceed reporting thresholds are required to report to TRI. About 20,000, or 13 percent of the nation's manufacturing facilities, actually reported.

How good is compliance with TRI? Do the facilities that reported represent almost 100 percent of the facilities that *should* report, or have only a fraction of those required to do so actually submitted their TRI information? In order to begin to answer these questions, EPA conducted a survey of facilities potentially subject to TRI reporting.

TRI compliance for 1987 was 66%; an additional 10,000 facilities should have reported.

The survey estimated that the overall TRI compliance rate for 1987 was 66 percent. That is, only two out of every three companies in the nation that should have reported actually did so. EPA estimates that an additional 10,000 facilities should have reported to TRI. Compliance rate varied with industries. The Chemical industry had the highest overall compliance rate, 88 percent—almost nine out of ten chemical manufacturers that should have reported to TRI actually did so. Manufacturers of instruments and of electrical equipment also had relatively high compliance rates, close to 80 percent, as did petroleum refineries. On the other hand, the Apparel industry and the Printing and Publishing industry had unusually low compliance rates, 13 percent and 31 percent respectively. (See Table 3–12.)

The fabricated metals industry had the largest number of non-reporting facilities.

The size of a given industry also affects the compliance picture. Even though the Chemical industry had the best compliance rate, the large number of facilities in the country still leaves the industry with an estimated 568 facilities that have not reported to TRI, but should have. The Fabricated Metals industry, with a compliance rate on par with the national average, nevertheless has the largest number of estimated non-reporting facilities (1,290) since there are a very large number of facilities in this industry category nationwide.

The greatest proportion of non-reporting is concentrated in medium-sized facilities, those with 20-49 employees. Smaller facilities tended to be in com-

Table 3-12. Adjusted Compliance Measures by 2-Digit SIC Codes.

SIC CODE	INDUSTRY	POTENTIALLY SUBJECT FACILITIES Number	TRI SUBMITTERS Number	TOTAL NON-RESPONDENTS Number	ADJUSTED COMPLIANCE RATE Percent
20	FOOD	9,910	1,683	1,164	59.1
21	TOBACCO*	75	25	0	—
22	TEXTILES	3,964	501	367	57.7
23	APPAREL	7,609	45	311	12.6
24	LUMBER/WOOD	8,623	691	368	65.2
25	FURNITURE	4,311	394	232	62.9
26	PAPER	5,033	737	389	65.4
27	PRINT & PUB.	16,272	315	700	31.0
28	CHEMICALS	7,357	4,089	568	87.8
29	PETROLEUM REF.	1,094	379	111	77.4
30	RUBBER	7,297	1,300	753	63.6
31	LEATHER	857	123	52	70.2
32	STONE/CLAY	8,161	688	1,013	40.4
33	PRIMARY METALS	4,726	1,557	832	65.2
34	FABRICATED METALS	18,521	2,736	1,290	68.0
35	MACHINERY	19,264	926	529	63.7
36	ELECT. EQUIPMENT	9,632	1,610	455	78.0
37	TRANSPORT. EQUIP.	5,094	1,047	612	63.1
38	MEASURE./PHOTO.	4,966	359	78	82.2
39	MISCELLANEOUS	5,028	380	346	52.4
	TOTAL	147,790	19,585	10,169	65.8

* Absence of non-respondents in the tobacco industry may be due to the small sample size of the survey.

SOURCE: ABT Associates, Inc. "Analysis of Non-Respondents to Section 313 of EPCRA", March 30, 1990. Report to the Economics and Technology Division of the Office of Toxic Substances at EPA.

pliance more frequently, probably due in large measure to the fact that fewer small facilities handle TRI chemicals at above-threshold quantities. Larger facilities had the best compliance rate, perhaps because they tend to be better informed about their TRI reporting requirements. (See Table 3-13.)

These data are rough estimates, at best, based on a sampling of facilities conducted over the phone. It is clear, however, that many facilities, either deliberately or through a lack of awareness of their responsibilities, failed to fulfill their reporting obligations under TRI for 1987. EPA will continue to evaluate the TRI compliance rate for 1988 reporting, and is working on several fronts to improve the compliance rate. The Agency conducts training sessions around the country, provides explanatory literature on TRI, issues press releases explaining requirements, publishes articles, and works with trade associations to keep their industrial membership informed.

EPA's most important compliance effort, however, is its aggressive enforcement program. EPA conducts over 800 compliance inspections annually at facilities suspected of not reporting. Since the inception of the enforcement program in the latter part of 1988, 268 Civil Administrative Complaints have been issued for

Table 3-13. Adjusted Compliance Measures by Employee Size Category.

NUMBER OF EMPLOYEES	POTENTIALLY SUBJECT FACILITIES Number	TRI SUBMITTERS Number	TOTAL NON-RESPONDENTS Number	ADJUSTED COMPLIANCE RATE Percent
10-19	40,723	3,878	2,077	65.1
20-49	47,425	3,486	3,560	49.5
50 OR MORE	59,643	12,221	4,532	72.9
TOTAL	147,790	19,585	10,169	65.8

SOURCE: ABT Associates, Inc. "Analysis of Non-Respondents to Section 313 of EPCRA", March 30, 1990. Report to the Economics and Technology Division of the Office of Toxic Substances at EPA

nonreporting of the required TRI forms. As of July 1, 1990, more than three quarters of a million dollars in penalties have been collected in settlements. In addition to penalties, the Agency has also frequently obtained environmentally beneficial expenditures, such as reductions of toxic chemical releases, as conditions in settlements.

EPA's efforts to assist industrial compliance through active outreach, and to enforce TRI requirements, is continuing. The recently-available survey results on noncompliance will enable EPA to better target its activities.

READERS' COMMENTS

EPA is interested in readers' comments on the utility and value of this report. We welcome recommendations of other topics that should be included in future national reports. Please send your comments and suggestions in writing to:

THE EMERGENCY PLANNING AND COMMUNITY RIGHT-TOKNOW INFORMATION HOTLINE
U.S. ENVIRONMENTAL PROTECTION AGENCY
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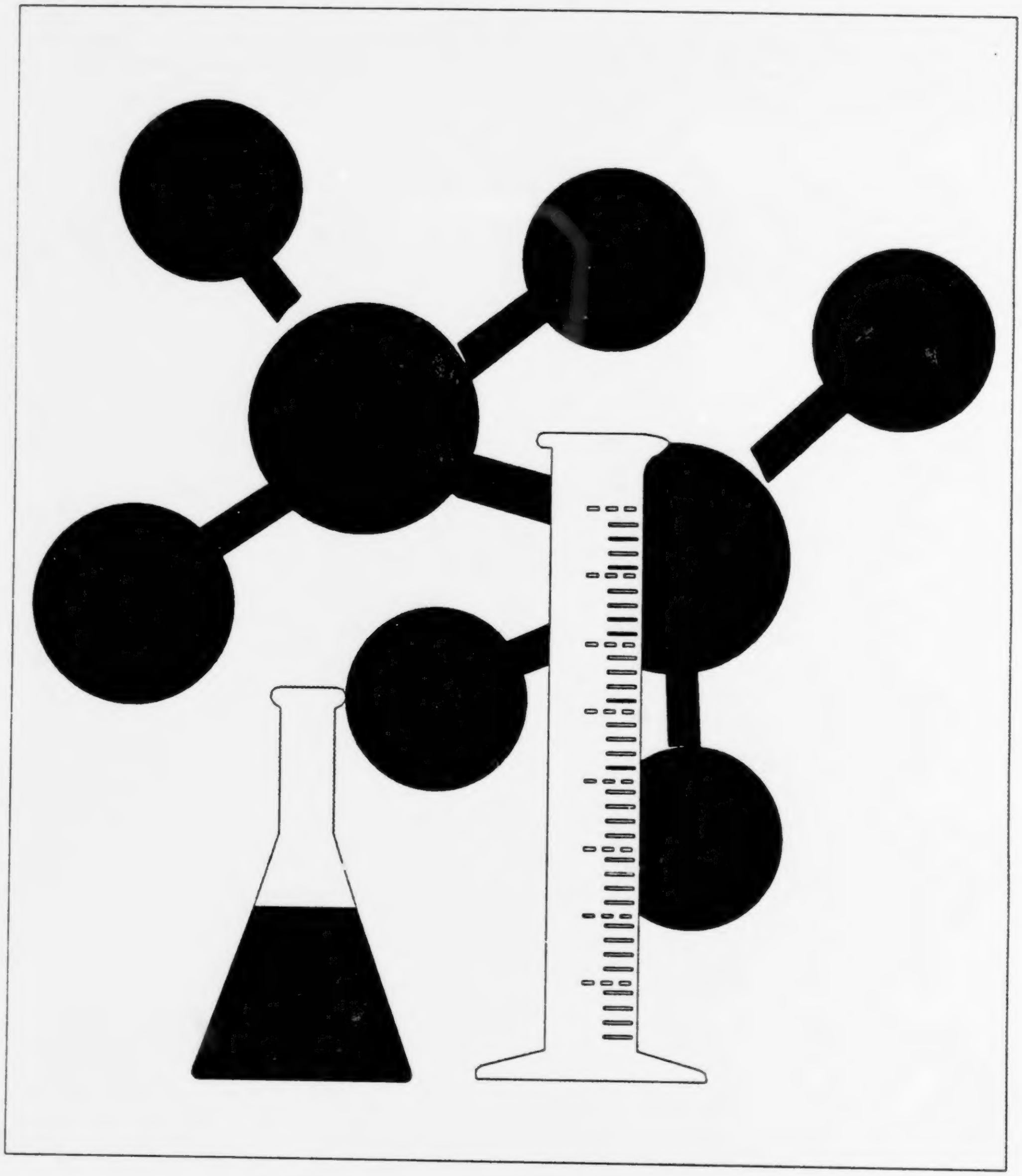

CHAPTER 4. TRI CHEMICALS

While the 6.2-billion-pound national total of TRI releases and transfers is large by any standard, knowledge of the chemical make-up of individual releases and transfers is important to interpret the health and environmental significance of TRI totals. The nature of the effects associated with TRI chemicals vary widely. For example, benzene is known to cause leukemia in humans, whereas the greatest concern over Freon 113 is its potential to deplete stratospheric ozone. Similarly, the potencies of TRI chemicals vary considerably—some have effects at low levels, while relatively large amounts of other chemicals may be needed to cause the same effects. This chapter provides a chemical overview of 1988 TRI totals.

THE CHEMICAL COMPOSITION OF TRI RELEASES AND TRANSFERS

Major Chemicals

Facilities released larger amounts of ammonium sulfate than of any other chemical in 1988 accounting for 12 percent of the TRI total (745.5 million of 6.2 billion pounds). Ammonium sulfate, a chemical of relatively low toxicity, is produced for use as an agricultural fertilizer, and is also a non-commercial co-product of various chemical manufacturing processes involving sulfuric acid and ammonium compounds and is a byproduct of coke ovens used to make steel (Primary Metals industry). (See Figure 4-1 and Table 4-1.)

Facilities generated more ammonium sulfate than any other TRI chemical waste.

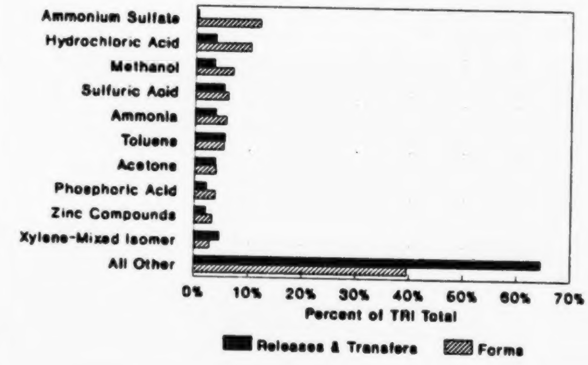

Figure 4-1. The 10 Chemicals with the Largest TRI Total Releases and Transfers Compared to Forms, 1988.

Table 4-1. The 25 Chemicals with the Largest TRI Total Releases and Transfers, 1988.

RANK		CHEMICAL	FORMS WITH RELEASES AND TRANSFERS		TOTAL RELEASES AND TRANSFERS		AVERAGE RELEASE/TRANSFER PER FORM
1988	1987		Number	Percent	Pounds	Percent	Pounds
1	1	AMMONIUM SULFATE	301	0.47	745,528,007	11.95	2,476,837
2	2	HYDROCHLORIC ACID	2,401	3.79	635,720,989	10.19	264,773
3	4	METHANOL	2,234	3.52	435,639,693	6.98	195,004
4	3	SULFURIC ACID	3,379	5.33	386,060,541	6.19	114,253
5	5	AMMONIA	2,435	3.84	356,101,165	5.71	146,243
6	6	TOLUENE	3,525	5.56	333,315,437	5.34	94,558
7	8	ACETONE	2,432	3.84	249,703,395	4.00	102,674
8	7	PHOSPHORIC ACID	1,429	2.25	241,602,716	3.87	169,071
9	11	ZINC COMPOUNDS	1,355	2.14	209,127,626	3.35	154,338
10	9	XYLENE (MIXED ISOMERS)	3,032	4.78	181,771,506	2.91	59,951
11	12	1,1,1-TRICHLOROETHANE	3,421	5.40	180,418,488	2.89	52,739
12	10	METHYL ETHYL KETONE	2,223	3.51	156,490,232	2.51	70,396
13	16	CHLORINE	1,424	2.25	147,050,483	2.36	103,266
14	14	DICHLOROMETHANE	1,451	2.29	134,212,442	2.15	92,497
15	25	MANGANESE COMPOUNDS	376	0.59	114,926,157	1.84	305,655
16	17	AMMONIUM NITRATE	153	0.24	107,223,350	1.72	700,806
17	15	CARBON DISULFIDE	82	0.13	82,748,299	1.33	1,009,126
18	19	NITRIC ACID	1,437	2.27	81,288,357	1.30	56,568
19	20	FREON 113	1,263	1.99	68,545,125	1.10	54,272
20	18	ZINC (FUME OR DUST)	524	0.83	66,013,145	1.06	125,979
21	24	GLYCOL ETHERS	1,413	2.23	62,255,269	1.00	44,059
22	26	ETHYLENE GLYCOL	1,180	1.86	55,713,223	0.89	47,215
23	29	COPPER COMPOUNDS	808	1.27	53,087,237	0.85	65,702
24	21	TRICHLOROETHYLENE	847	1.34	52,616,792	0.84	62,121
25	27	N-BUTYL ALCOHOL	1,022	1.61	52,004,930	0.83	50,885
		SUBTOTAL	40,147	63.35	5,189,164,604	83.15	
		TOTAL FOR ALL OTHERS	23,229	36.65	1,051,866,142	16.85	
		GRAND TOTAL	63,376	100.00	6,241,030,746	100.00	

Hydrochloric acid, methanol, sulfuric acid, and ammonia made up 1/4 of the national TRI total.

Facilities also reported large amounts of hydrochloric acid, methanol, sulfuric acid, and ammonia, each of which comprised six percent or more of the TRI total. In all, the 25 chemicals released or transferred in the largest amounts comprised 83 percent of the total reported for all chemicals. Thus, while TRI covers more than 300 chemicals, the majority of emissions are composed of fewer than one tenth of the chemicals on the list. (See Boxes 4-A and 4-B.)

Sulfuric acid was the chemical reported by the most facilities.

Sulfuric acid was reported more often than any other chemical. Approximately eight percent of all TRI forms submitted were for sulfuric acid, which is one of the largest production volume chemicals manufactured by the chemical industry, and which is used by a wide range of industries whenever there is a need for a relatively inexpensive acid. For example, a major use is as a "pickling" chemical to clean rust off of iron and steel prior to the application of any paint or coating. (See Table 4-2.)

Table 4-2. The 25 Chemicals Reported on the Most TRI Forms, 1988.

TRI TOTAL RANK	FORMS RANK	CHEMICAL	TRI FORMS REPORTING	
			Number	Percent
4	1	SULFURIC ACID	5,347	7.52
6	2	TOLUENE	3,553	5.00
11	3	1,1,1-TRICHLOROETHANE	3,481	4.89
10	4	XYLENE (MIXED ISOMERS)	3,067	4.31
2	5	HYDROCHLORIC ACID	3,027	4.26
5	6	AMMONIA	2,671	3.76
7	7	ACETONE	2,455	3.45
3	8	METHANOL	2,334	3.28
8	9	PHOSPHORIC ACID	2,324	3.27
12	10	METHYL ETHYL KETONE	2,242	3.15
18	11	NITRIC ACID	1,830	2.57
13	12	CHLORINE	1,725	2.43
33	13	COPPER	1,580	2.22
14	14	DICHLOROMETHANE	1,474	2.07
9	15	ZINC COMPOUNDS	1,474	2.07
21	16	GLYCOL ETHERS	1,450	2.04
22	17	ETHYLENE GLYCOL	1,379	1.94
19	18	FREON 113	1,272	1.79
34	19	CHROMIUM COMPOUNDS	1,077	1.51
27	20	STYRENE	1,055	1.48
25	21	N-BUTYL ALCOHOL	1,035	1.46
44	22	CHROMIUM	929	1.31
60	23	NICKEL	912	1.28
28	24	METHYL ISOBUTYL KETONE	911	1.28
23	25	COPPER COMPOUNDS	904	1.27
		SUBTOTAL	49,508	69.60
		TOTAL FOR ALL OTHERS	21,623	30.40
		GRAND TOTAL	71,131	100.00

Other commonly reported chemicals were toluene (an important chemical building block and solvent), 1,1,1-trichloroethane (a solvent often used to dissolve greases and oils), xylene (another common solvent), and hydrochloric acid (an inexpensive acid with a use pattern similar to that for sulfuric acid), all of which were reported in four percent or more of the forms. In all, the 25 most frequently reported chemicals accounted for more than two thirds of all TRI forms submitted. Note that the most frequently reported chemicals were not necessarily those with the largest releases and transfers. (Compare Tables 4-1 and 4-2.) Chemicals reported under TRI were not always released or transferred. The use of TRI chemicals did not always result in their releases or transfers.[1] For example, the use of sulfuric acid was reported on 5,347 forms, but only 3,379 of those forms reported any releases or transfers of the chemical. This is not unexpected because facilities may be using sulfuric acid in a totally enclosed manner; many facilities use it to neutralize basic wastes, consuming all the acid in the process.

(1) The reporting thresholds described in Chapter 1 (50,000 pounds if the TRI chemical is *manufactured* or *processed*, and 10,000 pounds if the chemical is *otherwise used*) apply even if no releases or transfers result from the manufacture or use. Thus, of the 71,131 TRI forms submitted for 1988, 11 percent (7,755) indicated that no releases or transfers of the chemical occurred.

BOX 4–A. CHANGES IN THE TRI CHEMICAL LIST

The Emergency Planning and Community Right-to-know Act, which created TRI, originally listed 309 individual chemicals and 20 chemical categories. Since then, EPA has removed several chemicals from the TRI list because the Agency concluded that these chemicals did not pose a significant toxic threat to humans or the environment (see Box 4-E). Other chemicals have been added to the TRI list. Still others have been proposed for deletion or addition, but final decisions have not yet been made. These changes and proposals are summarized below:

Deletions to TRI made *prior* to 1988 reporting

C.I. Acid Blue #9, diammonium salt
sodium sulfate
C.I. Acid Blue #9, disodium salt
titanium dioxide
melamine crystal

In addition, individual reporting for cyanide was combined with reporting for the chemical category covering cyanide compounds, so all forms of cyanide are now reported together as cyanide compounds.

Deletions to TRI made *after* 1988 reporting (will affect 1989 reporting)

sodium hydroxide
aluminum oxide (non-fibrous forms)

In addition, ammonium sulfate (solution) was removed from the list but will be incorporated under a broader definition of ammonia that will include ammonium sulfate and other aqueous ammonia solutions. Thus, the chemical must still be reported, but under a different name.

Chemicals *proposed* for deletion

barium sulfate
terephthalic acid
C.I. Pigment Blue 15
butyl benzyl phthalate
zinc sulfide
C.I. Pigment Green 7
phthalic anhydride
copper pigments
C.I. Pigment Green 36

Additions to TRI made *after* 1988 reporting (will affect 1990 reporting)

allyl alcohol
m-dinitrobenzene
dinitrotoluene (mixed isomers)
creosote
p-dinitrobenzene
isosafrole
2,3-dichloropropene
o-dinitrobenzene
toluene diisocyanate (mixed isomers)

BOX 4-B. INDIVIDUAL CHEMICALS VS. CHEMICAL CATEGORIES

The TRI list now includes 302 *individual* chemicals and twenty *categories* of chemical compounds. Each chemical category incorporates closely-related individual chemicals. Thirteen categories are built around heavy metals, such as lead compounds and mercury compounds, while others center on types of organic compounds (glycol ethers, chlorophenols, and polybrominated biphenyls). Appendix B contains a complete list.

Not all related chemicals are reported as categories, however. In some cases, different forms of a chemical appear on the list as individual entries. For example, *zinc (fume or dust)*, *zinc compounds* (a chemical category), and *Zineb* (a chemical that contains zinc) are listed separately. Likewise, the elemental form of *chromium* is to be reported separately from *chromium compounds*, and the different forms of xylene—*m*-xylene, *o*-xylene, and *p*-xylene, and xylene (mixed isomers)—are all listed individually. If reported amounts for all forms of xylene were combined, the total aggregated xylene releases would rank higher.

Data presented in this report do not combine releases and transfers of related chemicals that are listed individually. Chemical categories alone represent aggregates of related compounds.

The chemicals released and transferred in the largest amounts were not always those reported by the most facilities. For example, toluene was the second most frequently reported chemical (listed on 3,553 forms)—and actually had the greatest number of reports indicating that releases and transfers occurred (3,525 forms)—but ranked fifth for total releases and transfers with 333.3 million pounds. Ammonium sulfate, on the other hand, was released and transferred in larger amounts than any other TRI chemical, yet ranked 42nd for the number of TRI forms reporting releases and transfers (only 301 TRI forms), indicating that fewer facilities released larger amounts of ammonium sulfate than toluene.

Average releases and transfers reported by facilities varied considerably by chemical.

These differences are shown more clearly by calculating the average amount reported released or transferred per form. By this measure, ammonium sulfate tops the list, with an average of 2.5 million pounds reported per form (for 301 forms). Carbon disulfide, which ranked 17th for total releases and transfers, ranks third for average amounts reported per form: 82 facilities reported an average of one million pounds per form. Carbon disulfide is a chemical intermediate used in the manufacture of a wide range of products including rayon fiber, cellophane, rubber, and pesticides. [2] (See Table 4-1.)

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(2) Corrections and changes to the TRI database since this analysis was prepared have increased the amount of carbon disulfide by 42.9 million pounds, which leads to a larger average of 1.5 million pounds per form (see Box 3-C).

Comparison to 1987

Most chemicals with the largest totals for 1988 also played a major role in 1987 totals.

Similar chemicals made up a large share of the TRI totals for both 1987 and 1988, after changes in the TRI chemical list are accounted for (See Box 4–C and Chapter 2). Only three chemicals that were among the top 25 in 1987 were not in the top 25 in 1988: copper dropped from a rank of 13 in 1987 to 33 in 1988; ethylene from a rank of 22 to 30; and styrene from 23 to 27. The three chemicals new to the top 25 list for 1988 are ethylene glycol, copper compounds, and n-butyl alcohol. All three were near the top rankings in 1987. These changes are explored in more detail in Part III (Chapters 7 through 10). (See Table 4–3.)

Total releases and transfers decreased 11% . . .

Total releases and transfers decreased 11 percent from 1987 to 1988 (from 7.0 billion to 6.2 billion pounds). Releases and transfers for the top 25 chemicals (which accounted for 83 percent of all releases and transfers) decreased eight percent from 5.6 to 5.2 billion pounds or 433.0 million pounds. All other chemicals (accounting for only 17 percent of all releases and transfers), decreased 22 percent from 1.4 to 1.1 billion pounds or 303.4 million pounds. Thus, chemicals with smaller TRI releases and transfers decreased proportionately much more than the top chemicals on the list.

Table 4–3. Comparison of 1987 and 1988 TRI Total Releases and Transfers of the Top 25 Chemicals.

1988 RANK	1987 RANK	CHEMICAL	1988 RELEASES AND TRANSFERS		1987 RELEASES AND TRANSFERS	
			Pounds	Percent	Pounds	Percent
1	1	AMMONIUM SULFATE	745,528,007	11.95	814,932,127	11.68
2	2	HYDROCHLORIC ACID	635,720,989	10.19	644,856,938	9.24
3	4	METHANOL	435,639,693	6.98	435,550,127	6.24
4	3	SULFURIC ACID	386,060,541	6.19	478,195,883	6.85
5	5	AMMONIA	356,101,165	5.71	402,143,039	5.76
6	6	TOLUENE	333,315,437	5.34	362,178,333	5.19
7	8	ACETONE	249,703,395	4.00	252,961,335	3.63
8	7	PHOSPHORIC ACID	241,602,716	3.87	340,343,982	4.88
9	11	ZINC COMPOUNDS	209,127,626	3.35	193,484,430	2.77
10	9	XYLENE (MIXED ISOMERS)	181,771,506	2.91	224,213,405	3.21
11	12	1,1,1-TRICHLOROETHANE	180,418,488	2.89	189,130,017	2.71
12	10	METHYL ETHYL KETONE	156,490,232	2.51	197,310,127	2.83
13	16	CHLORINE	147,050,483	2.36	121,511,240	1.74
14	14	DICHLOROMETHANE	134,212,442	2.15	155,627,785	2.23
15	25	MANGANESE COMPOUNDS	114,926,157	1.84	57,269,705	0.82
16	17	AMMONIUM NITRATE	107,223,350	1.72	115,406,312	1.65
17	15	CARBON DISULFIDE	82,748,299	1.33	136,423,873	1.96
18	19	NITRIC ACID	81,288,357	1.30	75,078,121	1.08
19	20	FREON 113	68,545,125	1.10	64,410,204	0.92
20	18	ZINC (FUME OR DUST)	66,013,145	1.06	97,538,784	1.40
21	24	GLYCOL ETHERS	62,255,269	1.00	58,622,937	0.84
22	26	ETHYLENE GLYCOL	55,713,223	0.89	50,002,667	0.72
23	29	COPPER COMPOUNDS	53,087,237	0.85	44,740,593	0.64
24	21	TRICHLOROETHYLENE	52,616,792	0.84	62,206,897	0.89
25	21	N-BUTYL ALCOHOL	52,004,930	0.83	48,018,185	0.69
		SUBTOTAL	5,189,164,604	83.15	5,622,157,046	80.58
		TOTAL FOR ALL OTHERS	1,051,866,142	16.85	1,355,275,496	19.42
		GRAND TOTAL	6,241,030,746	100.00	6,977,432,542	100.00

BOX 4-C. THE TRI LIST OF TOXIC CHEMICALS

What is a toxic chemical? The question is difficult to answer, because toxic effects depend not only on the intrinsic properties of a chemical, but also on the conditions in which people or the environment are exposed to it. Chemicals vary greatly in their physical make-up, in the ways that they travel through the environment, in the potential routes and amounts of exposure, and fate in the environment or in biological systems. Furthermore, the issue of what effects are considered to be toxic depends considerably on one's perspective: is drowsiness a toxic effect? Or is toxicity defined by irreversibility? Thus, neither EPA, nor Congress, nor the scientific community have ever created a universally-accepted list of toxic chemicals.

To circumvent the problem of defining toxic chemicals, Congress created the TRI list by combining chemical lists previously developed for similar reporting laws in the States of New Jersey and Maryland. These states had based their respective lists partly on toxicity information, but also on considerations of the amount produced or used in the state, the regulatory status, the presence in the environment, and professional judgement about potential hazards. Thus, the TRI list covers a spectrum of toxicity concerns, from mildly toxic to acutely toxic. Some chemicals may not be toxic at all, and will be removed from the TRI list in subsequent reporting years after careful review by EPA. On the other hand, toxic chemicals not currently on the list will be added.

Readers should keep in mind that the amounts of chemicals reported in TRI do not translate directly to concerns about toxic effects.

TRI totals for phosphoric acid and sulfuric acid decreased 99 million pounds (29 percent) and 92.1 million pounds (19 percent), respectively—more than the decreases for any other chemicals. Because both chemicals are acids, facilities could have decreased releases and transfers by neutralizing the chemicals, rather than decreasing waste generation.[3] That is, under TRI reporting requirements, release and transfer amounts of a sulfuric acid pickling waste need not be reported if neutralized by sodium hydroxide (lye) to form a sodium sulfate salt solution prior to release. (Facilities would still have to submit a TRI form, however, if the sulfuric acid was used in amounts greater than 10,000 pounds, but release or transfer amounts could be reported as zero.) Chapter 12 discusses TRI data on waste treatment to gauge whether neutralization does, in fact, appear to be responsible for the decrease.

. . .with phosphoric acid and sulfuric acid decreasing the most.

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(3) Prior to the reporting for 1988, EPA issued instructions to clarify that releases and transfers of any acids and bases which have been neutralized before release or transfer need not be reported.

Manganese compounds increased the most from 1987 to 1988.

Reported amounts for 15 of the top 25 chemicals decreased while ten increased. Manganese compounds increased the most (in absolute number of pounds), doubling to 114.9 million pounds. Chlorine had the second largest increase—26 million pounds or 21 percent. Manganese compounds are used by the chemical industry as reagents to make many different substances. Chlorine, also a common reagent, is used to disinfect wastewater and drinking water. (Chapters 7–10 provide additional details on these increases.)

Other Chemicals

Manufacturers reported small or no emissions for 1/4 of all TRI chemicals.

Manufacturers reported very small releases of 18 TRI chemicals. Two chemicals, 4-aminobiphenyl and bis(chloromethyl) ether, were each released or transferred in amounts less than 15 pounds, and 16 other chemicals were reported in total amounts less than 1,000 pounds. In addition, facilities submitted TRI forms on two chemicals (C.I. solvent yellow 14, and n-nitrosodimethylamine) reporting chemical use, but with no associated releases to the environment or transfers off-site. (See Appendix B.)

No forms were filed for 54 of the 322 TRI chemicals and chemical compounds. Some unreported chemicals, such as poly brominated biphenyls and beta-naphthylamine are not believed to be in commerce in the United States. The use of other unreported chemicals, among them the insecticides aldrin and toxaphene, have been greatly restricted through pesticide regulations. (See Table 4-4.)

Other chemicals, such as 2-acetylaminofluorene and benzidine, both of which are potent cancer-causing chemicals, are believed to be used for research purposes only. Osmium tetroxide is a fixative used for electron microscopy in such small quantities that it would be unlikely to trigger reporting thresholds. Mustard gas, a chemical warfare agent, is no longer commonly manufactured; the existing large stockpiles are planned for destruction.

Chemical Classes

In this report, TRI chemicals and categories have been grouped into the following five classes based on their structural similarity:

- (simple) acids, bases, and salts (hereafter referred to as acids/bases/salts);
- halo-organics;
- metals and metal compounds;
- non-metallic inorganics; and
- organics (non-halogenated).

(Appendix B contains a list of the chemicals in each class.) The use of such classes is an effort to reveal general patterns in the TRI data that are difficult to discern when analyzing all 322 chemicals individually.

Although they are not chemically related, mixtures and trade secrets are treated as classes, because they could not be merged into the other classes. Under TRI

TABLE 4-4. THE 54 TRI CHEMICALS WITH NO FORMS REPORTING, 1988.

ACIDS/BASES/SALTS

ALL REPORTED

HALO-ORGANICS

ALDRIN
O-ANISIDINE HYDROCHLORIDE
2-CHLOROACETOPHENONE
CHLOROBENZILATE
1,2-DIBROMO-3-CHLOROPROPANE
DICHLOROBROMOMETHANE
HEXACHLORONAPHTHALENE
OCTOCHLORONAPHTHALENE
POLY BROMINATED BIPHENYLS
O-TOLUIDINE HYDROCHLORIDE
TOXAPHENE
TRIS(2,3-DIBROMOPROPYL) PHOSPHATE

METALS AND METAL COMPOOUNDS

C.I. DIRECT BROWN 95
OSMIUM TETROXIDE
THALLIUM

NON-METALLIC INORGANICS

ALL REPORTED

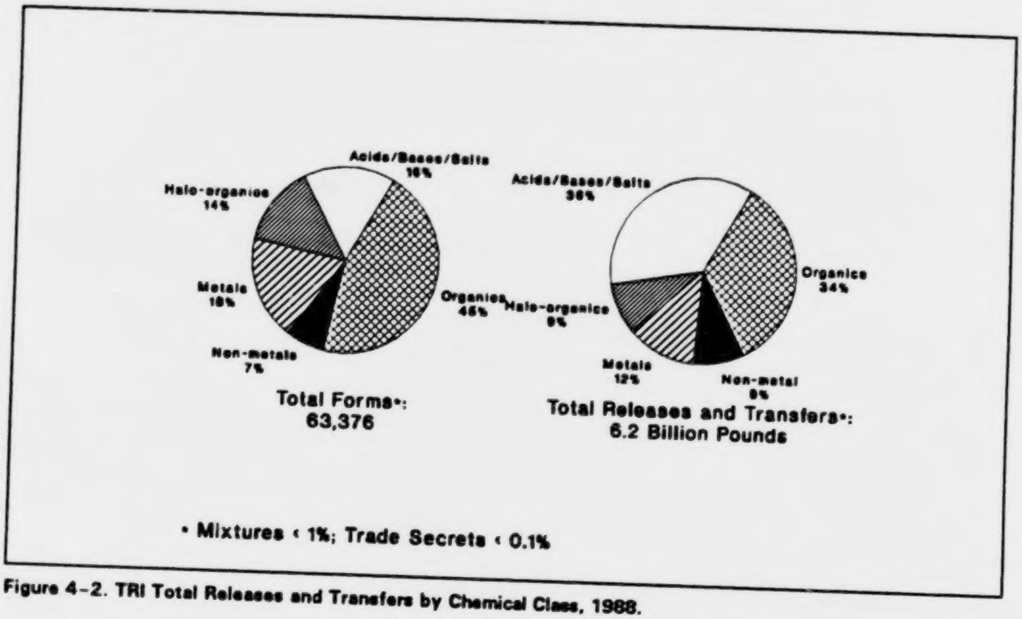
ORGANICS

2-ACETYLAMINOFLUORENE
2-AMINOATHRAQUINONE
1-AMINO-2-METHYLANTHRAQUINONE
BENZIDINE
BETA-NAPHTHYLAMINE
BETA-PROPIOLACTONE
C.I. ACID GREEN 3
C.I. BASIC RED 1
C.I. DIRECT BLACK 38
C.I. DIRECT BLUE 6
C..I. FOOD RED 5
C.I. SOLVENT ORANGE 7
C.I. SOLVENT YELLOW 34
C.I. VAT YELLOW 4
DIALLATE
DIAZOMETHANE
DIEPOXYBUTANE
4-DIMETHYLAMINOAZOBENZENE
3,3'-DIMETHOXYBENZIDINE
3,3'-DIMETHYLBENZIDINE
DIMETHYLCARBAMYL CHLORIDE
1,2-DIPHENYLHYDRAZINE
HEXAMETHYLPHOSPHORAMIDE
MUSTARD GAS
5-NITRO-O-ANISIDINE
4-NITROBIPHENYL
NITROFEN
NITROGEN MUSTARD
N-NITROSODI-N-BUTYLAMINE
N-NITROSODIETHYLAMINE
N-NITROSO-N-ETHYLUREA
N-NITROSO-N-METHYLUREA
N-NITROSOMETHYLVINYLAMINE
N-NITROSOMORPHOLINE
N-NITROSONORNICOTINE
N-NITROSOPIPERIDINE
N-NITROSODI-N-PROPYLAMINE
4,4'-THIODIANILINE
TRIAZIQUONE

requirements, facilities reported chemicals as *mixtures* if they used mixtures or trade name products (such as a commercially-available cleaning solvent) known to contain TRI chemicals, but could not identify the exact chemical contained in the mixture.[4] Thus, the release and transfer amounts of mixtures cannot be added to the appropriate classes. Facilities claiming *trade secrets* were required to provide generic names for the trade secret chemical, but these names do not necessarily indicate enough information about chemical structure to classify them. Mixtures and trade secret chemicals, however, make up only a small proportion of TRI reporting.

Acids/bases/salts and organic compounds comprised 70% of the 1988 TRI total.

Acids/bases/salts accounted for the largest percentage (36 percent) of total releases and transfers in 1988 with organics accounting for the second largest (34 percent). In contrast, 45 percent of all TRI *forms* reported releases or transfers of organics, whereas acids/bases/salts were only reported on 16 percent of the forms. Thus, acids/bases/salts were reported in relatively large amounts on few forms, while organics were reported in relatively small amounts on many forms. (See Figure 4-2 and Table 4-5.)



* Mixtures < 1%; Trade Secrets < 0.1%

Figure 4-2. TRI Total Releases and Transfers by Chemical Class, 1988.

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(4) Most suppliers are now required to notify their customers of the identities and amounts of TRI chemicals in mixtures or trade name products sold to them.

Releases and transfers of chemicals in the acids/bases/salts class decreased by 306.0 million pounds or 13 percent, from 2.5 to 2.2 billion pounds. Releases of organics also dropped, going from 2.4 billion pounds in 1987 to 2.1 billion pounds in 1988—a reduction of 12 percent. (Compare Figure 4-2 with Figure 2-2 in Chapter 2.)

TRI totals of acids/bases/salts and organics decreased 11% from 1987 to 1988.

Acids/Bases/Salts

Facilities reported releases and transfers of nine TRI chemicals and one category (cyanide compounds) classified as acids/bases/salts. These chemicals accounted for 16 percent of all forms reporting releases and transfers and for 36 percent of all releases and transfers. Within the acids/bases/salts class, five chemicals accounted for 78 percent of TRI forms and 95 percent of all releases and transfers by class. The acids/bases/salts with the largest TRI totals were ammonium sulfate, sulfuric acid, hydrochloric acid, phosphoric acid, and ammonium nitrate—the same as for 1987. (See Table 4-5 and Appendix B.)

10 acids/bases/salts made up 36% of all TRI releases and transfers.

Organics

The largest number of TRI chemicals can be classified broadly as non-halogenated organics: carbon-containing compounds that do not contain the elements commonly known as halogens (fluorine, chlorine, bromine, or iodine). Facilities reported releases and transfers of 144 organics. Organics were listed on 45 percent of the total number of TRI forms that reported releases and transfers greater than zero and accounted for 34 percent of the TRI total amount.

Organic chemicals made up the 2nd largest share with 34%.

The top organics, both for number of forms and amount of releases and transfers, were methanol, toluene, acetone, xylene (mixed isomers), and methyl ethyl ketone. These chemicals were the top five in 1987 also. They accounted for 48 percent of all forms reported for the class and for 64 percent of all releases and transfers for the class. (See Table 4-5 and Appendix B.)

Halo-organics

This report classifies organic chemicals that contain one or more halogen atoms (fluorine, chorine, bromine, or iodine) in a separate class (apart from organics that do not contain halogens)—the halo-organics. This class contains diverse chemicals, including some chlorinated hydrocarbons that tend to be relatively persistent in the environment and that have been the subject of extensive environmental regulation (such as carbon tetrachloride or chloroform), as well as lesser known chemicals. Halo-organics also include chemicals such as anisidine hydrochloride and toluidine hydrochloride, which share few of the chemical properties normally associated with halogenated organics. Hence, the name "halo-organics" is used to distinguish this class from its more familiar subset.

The 67 halo-organics reported accounted for 14 percent of the TRI forms reporting releases and transfers and nine percent of the total TRI amount. The five halo-organics that accounted for the largest number of TRI forms and releases

The 67 halo-organic chemicals comprised 9% of the TRI totals.

Table 4-5. The 5 Chemicals with the Largest TRI Total Releases and Transfers for Each Chemical Class, 1988.

TRI RANK	CHEMICAL	TRI TOTAL RELEASES AND TRANSFERS		
		Forms	Pounds	Percent
	ACIDS/BASES/SALTS			
1	AMMONIUM SULFATE (SOLUTION)	368	745,528,007	11.95
2	HYDROCHLORIC ACID	3,027	635,720,989	10.19
4	SULFURIC ACID	5,347	386,060,541	6.19
8	PHOSPHORIC ACID	2,324	241,602,716	3.87
16	AMMONIUM NITRATE (SOLUTION)	204	107,223,350	1.72
	SUBTOTAL	11,270	2,116,135,603	33.91
	TOTAL FOR ALL OTHERS	2,725	115,190,509	1.85
	TOTAL FOR CLASS	13,995	2,231,326,112	35.75
	HALO-ORGANICS			
11	1,1,1-TRICHLOROETHANE	3,481	180,418,488	2.89
14	DICHLOROMETHANE	1,474	134,212,442	2.15
19	FREON 113	1,272	68,545,125	1.10
24	TRICHLOROETHYLENE	854	52,616,792	0.84
32	TETRACHLOROETHYLENE	672	35,879,858	0.57
	SUBTOTAL	7,753	471,672,705	7.56
	TOTAL FOR ALL OTHERS	1,565	105,413,724	1.69
	TOTAL FOR CLASS	9,318	577,086,429	9.25
	METALS AND METAL COMPOUNDS			
9	ZINC COMPOUNDS	1,474	209,127,626	3.35
15	MANGANESE COMPOUNDS	434	114,926,157	1.84
20	ZINC (FUME OR DUST)	581	66,013,145	1.06
23	COPPER COMPOUNDS	904	53,087,237	0.85
26	MANGANESE	720	44,155,819	0.71
	SUBTOTAL	4,113	487,309,984	7.81
	TOTAL FOR ALL OTHERS	8,642	252,808,244	4.05
	TOTAL FOR CLASS	12,755	740,118,228	11.86
	NON-METALLIC COMPOUNDS			
5	AMMONIA	2,671	356,101,165	5.71
13	CHLORINE	1,725	147,050,483	2.36
42	ASBESTOS (FRIABLE)	131	22,607,674	0.36
50	CHLORINE DIOXIDE	120	13,561,237	0.22
69	ARSENIC COMPOUNDS	243	7,020,945	0.11
	SUBTOTAL	4,890	546,341,504	8.75
	TOTAL FOR ALL OTHERS	226	4,562,707	0.07
	TOTAL FOR CLASS	5,116	550,904,211	8.83
	ORGANICS (NON-HALOGENATED)			
3	METHANOL	2,334	435,639,693	6.98
6	TOLUENE	3,553	333,315,437	5.34
7	ACETONE	2,455	249,703,395	4.00
10	XYLENE (MIXED ISOMERS)	3,067	181,771,506	2.91
12	METHYL ETHYL KETONE	2,242	156,490,232	2.51
	SUBTOTAL	13,651	1,356,920,263	21.74
	TOTAL FOR ALL OTHERS	16,143	769,761,485	12.33
	TOTAL FOR CLASS	29,794	2,126,681,748	34.08
49	MIXTURES	130	13,607,176	0.22
114	TRADE SECRETS	23	1,306,842	0.02
	GRAND TOTAL	71,131	6,241,030,746	100.00

and transfers for the class in 1988 were 1,1,1-trichloroethane, dichloromethane, Freon 113, trichloroethylene, and tetrachloroethylene. These were the same top five chemicals for the class in 1987. The chemical 1,1,1-trichloroethane accounted for the largest number of forms (38 percent) and for the largest amount of releases and transfers (31 percent). (See Table 4-5 and Appendix B.)

Metals and Metallic Compounds

The 34 TRI chemicals classified as metals and metallic compounds accounted for 18 percent of TRI forms reporting releases and transfers, and for 12 percent of the TRI total amount. Zinc compounds, manganese compounds, zinc (fume or dust), copper compounds, and manganese made up the largest share of releases and transfers representing 66 percent of the releases and transfers by class. All except manganese were in the top five as reported for 1987. Copper dropped out of the top five due to a significant decrease in the releases and transfers reported by Kennecott Utah Copper, Bingham Canyon, Utah. (See Table 4-5, Box 4-B, and Appendix B. See also Box 7-A for an explanation of the decrease at Kennecott Copper.)

Metals and metallic compounds made up 12% of the 1988 TRI total.

Non-metallic Inorganics

The ten non-metallic inorganics accounted for seven percent of forms and for nine percent of all releases and transfers. The top five chemicals were ammonia, chlorine, asbestos (friable), chlorine dioxide, and arsenic compounds. These chemicals were the same top five for their class in 1987. Ammonia lead the class both for number of forms (54 percent of the total for the class) and for releases and transfers (65 percent). (See Table 4-5.)

The 10 non-metallic inorganics accounted for 9% of the TRI total.

Mixtures

TRI facilities reported 130 mixtures on 0.2 percent of all TRI forms submitted. This represented a significant decrease from the 283 mixtures reported in 1987. Releases and transfers of mixtures totalled 14 million pounds, or 0.2 percent of all releases and transfers. This was a decrease from the 18 million pounds of mixtures released or transferred in 1987. Given the small amount of releases and transfers of mixtures, the inability to attribute them to the appropriate TRI chemicals does not affect significantly the national conclusions presented in this report. The 25 mixtures reported in the largest amounts in 1988 represented 98 percent of all releases and transfers for mixtures.[5] However, when the chemical composition of a mixture is known, facilities must provide separate reports for each TRI chemical in it. (See Table 4-6.)

Amounts reported as mixtures decreased from 1987 to 1988; mixtures make up less than 0.5% of the TRI total.

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(5) Facilities are to report mixtures when they know the mixture contains a TRI chemical, but are not certain of the identity. For example, a facility may use a trade name product that lists "chlorinated hydrocarbons" among its ingredients, but does not indicate the specific chemicals.

Table 4-6. The 25 Mixtures and Trade Name Products with the Largest TRI Total Releases and Transfers, 1988.

NAME OF MIXTURE	FORMS Number	TOTAL RELEASES AND TRANSFERS Pounds	Percent
NONCHLORINATED SOLVENTS IN WASTE FUEL	2	6,345,618	46.63
BRICKS/SOIL/W/ZINC 5000 PPM - CALIF REG WASTE	1	2,699,920	19.84
WASTE ZINC OXIDE/ROCK/WOOD/CALIF. REG. WASTE	1	920,833	6.77
SOLVENT BLEND - 5892	1	687,926	5.06
REFRACTORY MATERIAL - 56.7% ALUMINUM OXIDE	1	554,700	4.08
RESINS (20-62% STYRENE, CAS NO. 100-4205)	1	239,100	1.76
STAIN, LACQUER, SEALER, SOLVENTS	2	225,320	1.66
KEMVAR TOP COAT VARNISH	1	204,926	1.51
CHLORINATED SOLVENTS IN WASTE FUEL	1	189,670	1.39
DRYWALL PLASTER OF PARIS TALC, MICA, QUARTZ	1	172,500	1.27
NITRIC ACID/WATER BATH	1	170,230	1.25
MODIFIED NITROCELLULOSE SOLUTION	1	114,200	0.84
BLANK	1	102,361	0.75
CHEMSOLV 6610 SOLVENT	1	90,500	0.67
ETHYLENE GLYCOL MIXTURE	1	89,300	0.66
ALKANOLAMINE	1	69,000	0.51
CAUSTIC SODA - RAYONGRADE NAOH 50% SOLUTION	1	68,750	0.51
POLY FOAM B (CAS. NOS. 75-69-4, 25791-96-2, 75-71-8)	1	64,950	0.48
GELCOATS	1	53,000	0.39
CHLORINE	2	49,444	0.36
MIXTURE OF AROMATIC HYDROCARBONS AND KETONES	2	40,250	0.30
ALKANOLAMINE FORMULATION	1	31,300	0.23
UNSATURATED POLYESTER RESIN, STYRENE SUPPRESSED	1	30,976	0.23
CRESYLIC ACID/POLYURETHANE/POLYESTERIMIDE	1	27,115	0.20
GENESOLV 5535	1	26,780	0.20
SUBTOTAL	29	13,268,669	97.51
TOTAL FOR ALL OTHERS	101	338,507	2.49
GRAND TOTAL	130	13,607,176	100.00

Table 4-7. TRI Facilities Claiming Trade Secrets, 1988.

FACILITY NAME	CITY	STATE	GENERIC CHEMICAL NAME	TOTAL RELEASES AND TRANSFERS Pounds	Percent
CHEMONICS INDUSTRIES INC.	ORLAND	CA	AMIDE	750	0.06
PROTO CORP.	CLEARWATER	FL	INORGANIC FLAME RETARDANT	750	0.06
HOOVER TREATED WOOD PRODUCTS	THOMSON	GA	MINERAL ACID	250	0.02
FIRESTONE SYN. RUBBER & LATEX CO.	LAKE CHARLES	LA	HYDROCARBON CO1	185,828	14.22
ADAMS PLANT	ADAMS	MA	QUENCHING AGENT	0	0.00
UNITED GLAZED PRODUCTS MARYLAND	BALTIMORE	MD	USATURATED ESTER	750	0.06
LINCOLN PULP & PAPER CO. INC.	LINCOLN	ME	MULTI-PROTIC INORGANIC ACID	0	0.00
UNITED GLAZED PRODUCTS MICHIGAN	LANSING	MI	USATURATED ESTER	750	0.06
EAST SHORE CHEMICAL CO.	MUSKEGON	MI	SUBSTITUTED PHENOL	750	0.06
PFIZEER INC.	CLOQUET	MN	QUENCHING AGENT	0	0.00
M. ARGUESO & CO. INC.	MAMARONECK	NY	BENZENEDICARBOXLIC ACID	19,000	1.45
TITANIUM BUSINESS OPERATION	MILWAUKIE	OR	COMPOUND BETA (SOLID)	101,327	7.75
JOHNSON MATTHEY	WAYNE	PA	INORGANIC SALT	3,230	0.25
FIRESTONE SYN. RUBBER & LATEX CO.	ORANGE	TX	CYCLIC HYDROCARBON	678,000	51.88
DIXIE CHEMICAL CO. INC.	PASADENA	TX	ORGANIC NITRILE	96,673	7.40
BASF CORP.	FREEPORT	TX	PHENYL COMPOUND	21,350	1.63
DIXIE CHEMICAL CO. INC.	PASADENA	TX	HALOGENATED HYDROCARBON	1,402	0.11
ALLIED FIBERS TECHNICAL CENTER	CHESTERFIELD	VA	HALOGENATED ALKANE	157,250	12.03
HOOVER TREATED WOOD PRODUCTS	MILFORD	VA	MINERAL ACID	250	0.02
APPLETON PAPERS INC.	APPLETON	WI	BISPHENOL	18,000	1.38
3M	NEKOOSA	WI	ALIPHATIC HYDROCARBON	12,957	0.99
3M CARBONLESS	NEKOOSA	WI	AROMATIC ESTER	7,575	0.58
PFIZER INC. WISCONSIN RAPIDS PLANT	WISCONSIN RAPIDS	WI	QUENCHING AGENT	0	0.00
TOTAL				1,306,842*	100.00

* Total Represents .02 Percent Of TRI Total Releases and Transfers

Trade Secrets

TRI requirements allow facilities to claim only the chemical identity to be trade secret on a TRI form, and then only under criteria that must be substantiated when the report is filed (Chapter 1). Trade secret claims must be accompanied by generic names describing the structure of the chemical. EPA received 23 forms from 21 facilities in 1988, down from the 37 accepted in 1987.

Trade secret releases and transfers declined by almost 1/2 in 1988, dropping from 2.4 to 1.3 million pounds.

In 1988 total releases and transfers for trade secrets amounted to 1.3 million pounds, down from the 2.4 million pounds in 1987. The 23 forms with trade secret claims comprised 0.02 percent by weight of all releases and transfers reported in 1988. Four forms reported zero releases and four reported total releases and transfer greater than 100,000 pounds. The maximum amount of releases and transfers from an individual facility covered by a trade secret claim was 678,000 pounds of a "cyclic hydrocarbon" reported by Firestone Synthetic Tire and Rubber Company, Orange, Texas. This amount accounted for 52 percent of all releases and transfers claimed as trade secrets. Clearly, the small number and weight of chemicals subject to trade secrecy claims does not significantly affect the national conclusions presented in this report. (See Table 4–7.)

ENVIRONMENTAL DISTRIBUTION

The environmental distribution varied considerably from chemical to chemical. Some chemicals were released directly from the facility site, while others were more often transferred off-site. Particular chemicals are most commonly released in one or two forms—as air emissions, for example, or discharges to surface water and to public sewage treatment plants. For example, ammonium sulfate was predominantly injected underground (56 percent) or transferred to public sewage systems (26 percent). On the other hand, 99 percent of the carbon disulfide released took the form of on-site air emissions. (See Figure 4–3 and Table 4–8.)

Organic, halo-organic, and non-metallic inorganic chemicals were emitted primarily to air...

Many organic, halo-organic, and non-metallic inorganic chemicals, such as toluene, dichloromethane, and chlorine, respectively, evaporate readily, making air emissions the most common form of release. Volatile solvents like trichloroethylene and dichloromethane may escape to air when used in unsealed containers for purposes such as cleaning parts or while being formulated into products such as paints or inks. Furthermore, regulations prohibit the disposal of many organic and halo-organic chemicals in landfills. If not properly contained, these chemicals (many of which are quite toxic) may migrate into ground water and eventually find their way into drinking water supplies. Overall, 83 percent of halo-organic, 71 percent of non-metallic inorganic, and 67 percent of organic releases and transfers were emitted to the air. (See Figure 4–4.)

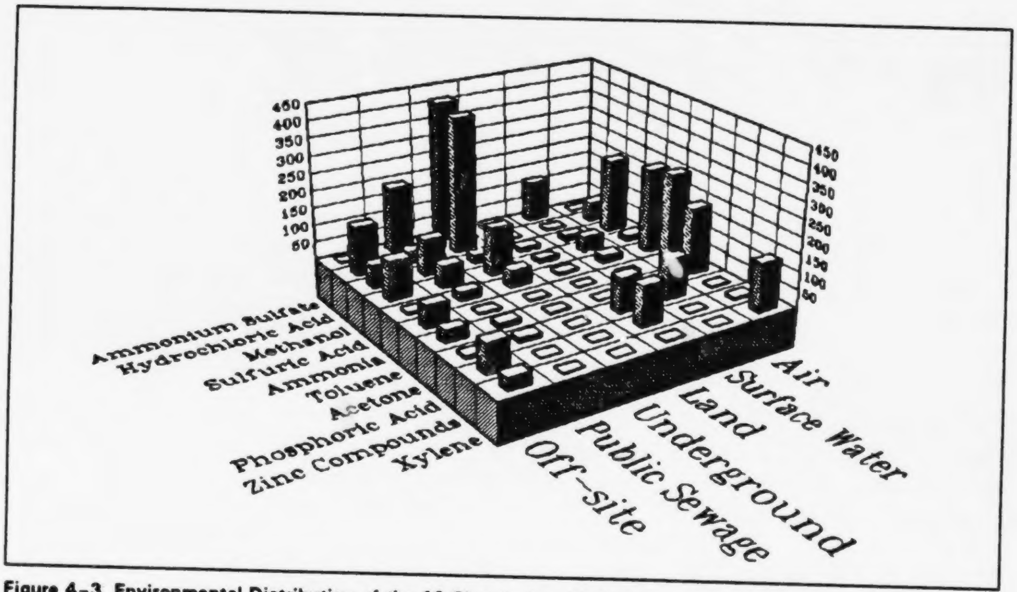

Figure 4-3. Environmental Distribution of the 10 Chemicals with the Largest TRI Total Releases and Transfers, 1988.

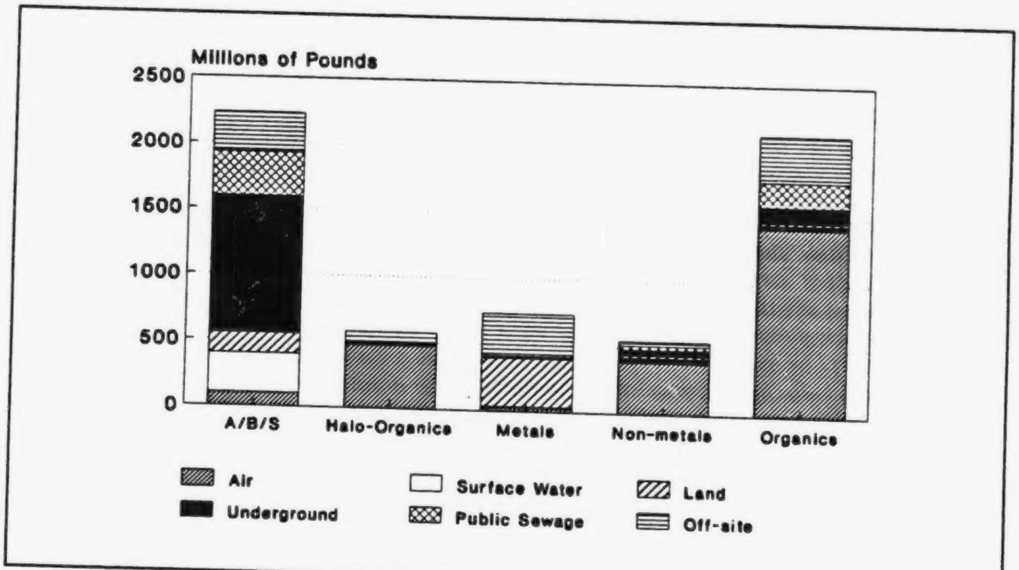

Figure 4-4. Environmental Distribution of TRI Total Releases and Transfers, 1988.

Table 4-8. Environmental Distribution of The 25 Chemicals With the Largest TRI Releases and Transfers.

RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	AIR Percent	SURFACE WATER Percent	LAND Percent	UNDER-GROUND Percent	PUBLIC SEWAGE Percent	OFF-SITE Percent
1	AMMONIUM SULFATE	745,528,007	0.09	15.94	1.93	55.81	25.62	0.60
2	HYDROCHLORIC ACID	635,720,989	8.84	0.68	0.63	62.30	5.49	22.05
3	METHANOL	435,639,693	49.44	3.82	2.79	5.47	23.81	14.67
4	SULFURIC ACID	386,060,541	4.28	11.76	3.41	35.77	16.04	28.74
5	AMMONIA	356,101,165	69.55	6.45	1.71	13.77	6.83	1.67
6	TOLUENE	333,315,437	79.04	0.08	0.26	0.43	1.05	19.14
7	ACETONE	249,703,395	78.28	0.46	0.17	1.18	5.68	14.23
8	PHOSPHORIC ACID	241,602,716	0.67	48.42	41.69	0.02	5.60	3.60
9	ZINC COMPOUNDS	209,127,626	3.44	0.50	54.80	0.05	0.73	40.49
10	XYLENE (MIXED ISOMERS)	181,771,506	77.17	0.16	0.48	0.07	2.28	19.85
11	1,1,1-TRICHLOROETHANE	180,418,488	89.61	0.07	0.06	0.00	0.18	10.08
12	METHYL ETHYL KETONE	156,490,232	80.59	0.05	0.07	0.03	0.57	18.68
13	CHLORINE	147,050,483	90.15	4.56	0.25	0.07	2.13	2.83
14	DICHLOROMETHANE	134,212,442	85.54	0.20	0.11	0.23	1.90	12.01
15	MANGANESE COMPOUNDS	114,926,157	1.41	0.62	72.98	5.93	1.58	17.48
16	AMMONIUM NITRATE	107,223,350	3.55	8.23	15.62	63.36	7.08	2.15
17	CARBON DISULFIDE	82,748,299	99.43	0.05	0.05	0.02	0.19	0.26
18	NITRIC ACID	81,288,357	13.51	3.99	1.76	19.80	28.69	32.25
19	FREON 113	68,545,125	91.71	0.05	0.02	0.01	0.15	8.07
20	ZINC (FUME OR DUST)	66,013,145	4.82	0.65	39.38	0.23	1.26	53.66
21	GLYCOL ETHERS	62,255,269	73.33	0.36	0.16	0.58	13.38	12.18
22	ETHYLENE GLYCOL	55,713,223	23.74	7.00	1.70	5.30	29.21	33.05
23	COPPER COMPOUNDS	53,087,237	7.51	0.33	64.72	0.26	0.78	26.40
24	TRICHLOROETHYLENE	52,616,792	88.18	0.03	0.04	0.00	0.15	11.61
25	N-BUTYL ALCOHOL	52,004,930	69.50	0.25	0.34	5.78	8.66	15.47
	SUBTOTAL	5,189,164,604	38.34	6.80	8.32	21.69	10.08	14.76
	TOTAL FOR ALL OTHERS	1,051,866,142	41.62	0.84	12.34	8.52	4.51	32.18
	GRAND TOTAL	6,241,030,746	38.90	5.79	9.00	19.47	9.14	17.70

In 1988, 47 percent of the releases and transfers of acids/bases/salts were injected underground into deep wells. Metals and metallic compounds, such as zinc compounds and manganese compounds, which do not evaporate easily, were generally disposed of on land or transferred off-site to facilities where they eventually are disposed of on land. In 1988, 50 percent of the releases and transfers of the metals were on-site land releases and another 44 percent were transferred off site.

...while acids/bases/salts were primarily injected underground and metals were most often disposed of on land.

HEALTH AND ENVIRONMENTAL EFFECTS OF TRI CHEMICALS

Most data compiled in this report present various aggregations of releases and transfers, broken down by chemical, by industry, by geography, or by the form of release to the environment. None of these data aggregates, however, directly reveal the health and environmental impacts of such releases. The health and environmental impacts of TRI releases and transfers depend on, among other factors, the types of toxicity effects associated with the chemical; those associated with the top-ranked TRI chemicals are summarized in Table 4-9.

Numerous other factors influence the nature and extent to which any TRI release or transfer causes health or environmental harm, among them the following:

- the degree of toxicity of the chemical;
- the route(s) of release;
- the route(s) of exposure;
- the persistence, bioconcentration, transport, and nature of the environmental degradation of the chemical; and
- various local factors, such as human and wildlife population patterns, atmospheric and climatic conditions, patterns of drinking water use, and sources of the food supply.

As a result of these and other factors, a few pounds of a highly toxic chemical released to the environment may be of far greater concern than a hundred thousand pounds of a less toxic chemical. Furthermore, the same number of pounds of a chemical released by different facilities may have different effects because of differing local conditions.

Such complex factors are beyond the scope of this National Report. However, EPA developed a two-volume book, *Toxic Chemical Release Inventory Risk Screening Guide*, to assist state and local officials and others in evaluating the potential risks posed by TRI releases at particular locales.[6] The guide sets forth a qualitative screening process designed to help "set priorities for follow-up activities and to determine the data that would be most useful for such evaluations." Follow-up work could include collecting data to be used for performing a rigorous quantitative risk assessment for determining the actual risk posed to humans and other environmental organisms. Chapter 12 provides an example of the risk screening approach using TRI data.

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(6) *Toxic Chemical Release Inventory Risk Screening Guide*, EPA 560/2-89-002 (Washington, DC: U.S. Environmental Protection Agency, July 1989).

Table 4-9. Effects of the 25 Chemicals with the Largest TRI Total Releases and Transfers, 1988.

RANK	CHEMICAL	HEALTH AND ENVIRONMENTAL EFFECTS
1	AMMONIUM SULFATE	IRRITATION TO LUNGS, SKIN, AND MUCOUS MEMBRANES
2	HYDROCHLORIC ACID	IRRITATION TO LUNGS, EYES, AND SKIN
3	METHANOL	NERVOUS SYSTEM EFFECTS, BLINDNESS, RESPIRATORY PROBLEMS
4	SULFURIC ACID	IRRITATION TO LUNGS, EYES, AND SKIN
5	AMMONIA	IRRITATION TO LUNGS, EYES, AND SKIN
6	TOLUENE	NERVOUS SYSTEM EFFECTS; IRRITATION TO NOSE AND EYES; CAN CONTRIBUTE TO SMOG FORMATION
7	ACETONE	LIVER AND KIDNEY EFFECTS; CAN CONTRIBUTE TO SMOG FORMATION
8	PHOSPHORIC ACID	IRRITATION TO LUNGS, EYES, AND SKIN
9	ZINC COMPOUNDS	EFFECTS VARY BY COMPOUND, INCLUDING NAUSEA, VOMITING, DAMAGE TO MUCOUS MEMBRANES
10	XYLENE (MIXED ISOMERS)	NOSE AND THROAT IRRITATION; EFFECTS ON NERVOUS SYSTEM, LIVER, KIDNEYS, SKIN, EYES, AND BONE MARROW; BIRTH DEFECTS
11	1,1,1-TRICHLOROETHANE	LIVER, KIDNEY AND SKIN EFFECTS; CONTRIBUTES TO OZONE LAYER DAMAGE
12	METHYL ETHYL KETONE	NERVOUS SYSTEM EFFECTS; BIRTH DEFECTS; CAN CONTRIBUTE TO SMOG FORMATION
13	CHLORINE	IRRITATION TO LUNGS, EYES, AND SKIN
14	DICHLOROMETHANE	LUNG CANCER AND LIVER CANCER
15	MANGANESE COMPOUNDS	EFFECTS VARY BY COMPOUND, INCLUDING EFFECTS ON THE NERVOUS AND PULMONARY SYSTEMS
16	AMMONIUM NITRATE	DIZZINESS, HEADACHE, VOMITING, CONVULSIONS, DEATH
17	CARBON DISULFIDE	NERVOUS SYSTEM, CARDIOVASCULAR, AND REPRODUCTIVE EFFECTS
18	NITRIC ACID	DENTAL EROSION, NOSE AND LUNG IRRITATION
19	FREON 113	CONTRIBUTES TO OZONE LAYER DAMAGE
20	ZINC (FUME OR DUST)	IRRITATION TO LUNGS AND SKIN, FEVER, CHILLS, COUGH, NAUSEA, AND VOMITING
21	GLYCOL ETHERS	MALE AND FEMALE REPRODUCTIVE EFFECTS, BIRTH DEFECTS, IRRITATION TO LUNGS; CAN CONTRIBUTE TO SMOG FORMATION
22	ETHYLENE GLYCOL	BIRTH DEFECTS, LIVER AND KIDNEY EFFECTS; CAN CONTRIBUTE TO SMOG FORMATION
23	COPPER COMPOUNDS	EFFECTS VARY BY COMPOUND, INCLUDING IRRITATION TO LUNGS, EYES, AND SKIN; EFFECTS ON NERVOUS SYSTEM AND KIDNEYS
24	TRICHLOROETHYLENE	EFFECTS ON THE NERVOUS SYSTEM, SKIN, LIVER, AND KIDNEYS; BIRTH DEFECTS; LUNG AND LIVER CANCER; CAN CONTRIBUTE TO SMOG FORMATION
25	N-BUTYL ALCOHOL	EFFECTS ON LIVER, SKIN, HEARING, BALANCE, AND RED BLOOD CELLS; CAN CONTRIBUTE TO SMOG FORMATION

Toxic Effects of Major TRI Chemicals

This chapter provides several summaries of reported releases and transfers based upon the nature of the toxicity of the TRI chemical. There is, however, no single accepted list of chemical toxicity and certainly no universally accepted "ranking" of chemicals from most toxic to least toxic, as described in Box 4-C. In fact, there are many different lists of toxic chemicals developed by different organizations and used for a wide range of purposes. A few of the lists used by EPA are described in Box 4-D, and the criteria for requiring TRI reporting are summarized in Box 4-E. Table 4-10 shows how EPA has ranked the top 25 TRI chemicals according to whether they are of high, moderate, or low toxicity for health and terrestrial effects, aquatic effects, and cancer. (See Boxes 4-C, 4-D, and 4-E.)

BOX 4-D. TOXICITY INDICES FOR SCREENING THE RISKS OF TRI RELEASES

EPA has generated many different toxicity lists (toxicity indices) under various environmental laws, including the Resource Conservation and Recovery Act, the Safe Drinking Water Act, and the Emergency Planning and Community Right-to-Know Act. Each law requires EPA to consider different types of toxic effects in different parts of the environment (air, water, land); the resulting lists differ in various ways that are not due to divergent scientific views. The different lists referenced in Table 4-10 are summarized below.

REPORTABLE QUANTITIES (RQS)

This list defines the minimum size of a chemical spill that must be reported to EPA under Superfund requirements. RQs are determined for each chemical depending on the type of exposure and effects of concern for spills, including the following effects: **Human Health And Terrestrial Toxicity (acute Toxicity, Chronic Toxicity, And Carcinogenic Potential)**; and **Aquatic Toxicity (acute And Chronic)**.

THRESHOLD PLANNING QUANTITIES (TPQS)

This list applies to extremely hazardous chemicals that may pose a danger in the event of an industrial accident. The list defines threshold planning quantities—the amounts of each of the 366 Extremely Hazardous Substances (listed under Title III Section 302 of the Emergency Planning and Right-to-know Act) that, if stored on-site at the facility, trigger requirements to develop plans to avoid and respond to potential chemicals accidents. TPQs are based on acute toxicity as well as the tendency of a chemical to become airborne. Therefore, if a chemical was ranked relatively high based upon its acute toxicity, but has little tendency to become airborne and disperse in the environment, it would be assigned a low TPQ ranking.

REFERENCE DOSES (RFDS)

Reference doses (RfDs) represent a threshold dose for noncarcinogenic effects below which no adverse effect is expected to occur. They are estimates of a daily exposure to a substance, over a lifetime, that is unlikely to result in harm. RfDs are meant to protect sensitive subpopulations as well as the average population. RfDs are estimated for different types of exposures and effects: **Inhalation Exposure And Oral Exposure.**

AMBIENT WATER QUALITY CRITERIA (AWQC)

Ambient Water Quality Criteria (AWQC) are estimates of concentrations of chemicals in surface waters (fresh or salt) that are not expected to harm the most sensitive aquatic organisms. AWQC may be set depending on the length of exposure: **Acute Toxicity and Chronic Toxicity**

BOX 4-E. HUMAN HEALTH AND ENVIRONMENTAL EFFECTS: The Foundation of the TRI List

The Emergency Planning and Community Right-to-Know Act (EPCRA) authorized EPA to change the TRI list based on the Agency's determination of whether a chemical is toxic to humans or the environment. EPCRA spelled out the criteria that EPA should use to define and evaluate toxic chemicals for possible addition to the list:

- The chemical is expected to cause significant adverse **acute human health effects** at concentration levels reasonably likely to exist beyond facility site boundaries as a result of releases. Acute effects occur rapidly as a result of short-term exposure usually to high concentrations of a chemical.
- The chemical is expected to cause in humans **cancer, birth defects, nervous system effects, gene mutations** that can be passed on to the next generation, or other **chronic health effects**—effects associated with repeated exposure to a chemical over a long period of time.
- The chemical is expected to cause significant and sufficiently serious adverse effects on the environment due to its **toxicity**, its **toxicity and persistence** (its tendency to remain in an unchanged form, rather than breaking down into smaller chemical parts), or its **toxicity and tendency to bioaccumulate** (to become increasingly concentrated in plant and animal tissues). (However, Congress imposed a limit for chemicals with adverse environmental effects: no more than 25 percent of all TRI chemicals can be listed solely on the basis of such effects. Thus, the law is designed to emphasize potential harm to humans.)

Conversely, if EPA finds that a chemical does not meet any of these three criteria, the Agency can remove the chemical from the TRI list.

Seven of the top 25 chemicals are considered highly toxic on one or more of the toxicity lists. Four of these are considered highly toxic to humans or terrestrial animals; six are considered highly toxic to fish and other aquatic organisms. On the other hand, four of the top 25 chemicals have not been ranked for toxic health or environmental effects. The absence of a toxicity rating does not necessarily indicate, however, that the chemical is not of concern. The chemical may cause indirect effects or pose hazards not measured by these indices. For example, Freon 113 is a chlorofluorocarbon considered to be of relatively low toxicity to humans and other organisms. However, its effect on the environment, particularly the ozone layer, is of great concern. Freon is associated with the depletion of the earth's protective ozone layer, which allows increased ultraviolet radiation from the sun to strike the earth, which in turn may result in increased cases of skin cancer.

4 leading TRI chemicals are highly toxic to humans or terrestrial animals, and 6 are highly toxic to fish and aquatic organisms.

The toxicity of chemicals varies according to the particular index. For example, zinc is considered highly toxic to aquatic organisms, but of medium toxicity for humans and terrestrial animals. One reason that zinc is a relatively potent toxicant to aquatic species is that it tends to bioaccumulate (concentrate) in the tissues of both fresh- and salt-water organisms. Conversely, carbon disulfide is considered

Table 4-10. Health and Environmental Effects* for the 25 Chemicals with the Largest TRI Total Releases and Transfers, 1988.

1988 RANK	CHEMICAL CLASS	CHEMICAL	TYPE OF TOXICITY				
			HEALTH/TERRESTRIAL		AQUATIC		CARCINOGENICITY (e)
			ACUTE(a)	CHRONIC(b)	ACUTE(c)	CHRONIC(d)	
1	ACIDS/BASES/SALTS	AMMONIUM SULFATE					
2	ACIDS/BASES/SALTS	HYDROCHLORIC ACID	MODERATE		LOW		
3	ORGANICS	METHANOL	LOW		LOW		
4	ACIDS/BASES/SALTS	SULFURIC ACID	MODERATE		MODERATE		
5	NON-METALS	AMMONIA	MODERATE	MODERATE	HIGH		
6	ORGANICS	TOLUENE	LOW	MODERATE	MODERATE		
7	ORGANICS	ACETONE		MODERATE	LOW		
8	ACIDS/BASES/SALTS	PHOSPHO[illegible]C ACID	LOW		LOW		
9	METALS	ZINC COMPOUNDS	HIGH	MODERATE	HIGH	HIGH	
10	ORGANICS	XYLENE (MIXED ISOMERS)	LOW		MODERATE		
11	HALO-ORGANICS	1,1,1-TRICHLOROETHANE	LOW	MODERATE	MODERATE		
12	ORGANICS	METHYL ETHYL KETONE	LOW	MODERATE	LOW		
13	NC[illegible]ALS	CHLORINE	HIGH		HIGH	HIGH	
14	[illegible]GANICS	DICHLOROMETHANE	LOW	MODERATE	LOW		HIGH
15	[illegible]	MANGANESE COMPOUNDS		HIGH	HIGH	HIGH	
16	ACID[illegible]ES/SALTS	AMMONIUM NITRATE					
17	ORGANICS	CARBON DISULFIDE	MODERATE	HIGH	LOW		
18	ACIDS/BASES/SALTS	NITRIC ACID	MODERATE		MODERATE		
19	HALO-ORGANICS	FREON 113					
20	METALS	ZINC (FUME OR DUST)		MODERATE		HIGH	
21	ORGANICS	GLYCOL ETHERS					
22	ORGANICS	ETHYLENE GLYCOL		LOW			
23	MIXTURES	COPPER COMPOUNDS	MODERATE	MODERATE	HIGH	HIGH	
24	HALO-ORGANICS	TRICHLOROETHYLENE	LOW	MODERATE	MODERATE	LOW	
25	ORGANICS	N-BUTYL ALCOHOL	LOW				

*Based on data from The Toxic Chemical Release Inventory Risk Screening Guide (Version 1.0), Volume 2:Appendices, EPA 560/2-89-002 (Washington,, DC:U.S. Environmental Protection Agency, July 1989). See related explanation and definitions in Box 4-F.

(a) Indicates toxic effects to humans or terrestrial animals associated with inhalation or ingestion of relatively high levels of the chemical over a short period of time. Based on threshold planning quantities (TPQs) and reportable quantities for acute toxicity (RQ Acute).

(b)Indicates toxic effects to humans or terrestrial animals associated with inhalation or ingestion of moderate or low levels of the chemicalover a long period of time. Based on reportable quantities for chronic (RQCH), inhalation reference doses (RFDI), and oral reference doses (RQ Acute).

(c) Indicates toxic effects to aquatic organisms associated with exposure to relatively high levels of the chemical over a short period of time. Based on reportable quantities for aquatic toxicity (RQ AQTX) and water quality criteria for acute toxicity (WQC Acute)

(d) Indicates toxic effects to aquatic organisms associated with exposure to moderate or low levels of the chemical over a long period of time. Based on water quality criteria for aquatic toxicity (WQC CTX).

(e) According to the carcinogen list used for TRI reporting. (See Box 4-F and EPA form R, Toxic Chemical Release Inventory Reporting Form, (EPA Form 9350-1(1-89)).

to be of medium to low toxicity for acute exposures, but of high potency for chronic effects. Acute exposure to carbon disulfide can cause stupor and unconsciousness. Chronic exposure to carbon disulfide, however, is associated with more severe effects, including birth defects and severe damage to the nervous system. (See Box 4-G.)

Carcinogens

Releases and transfers of the 123 carcinogens on the TRI list constituted approximately eight percent (or 471.6 million pounds) of the TRI total releases and transfers for 1988. (Box 4-F explains the definition of carcinogens used here and throughout this report. Appendix B lists all TRI chemicals that are considered carcinogens.) This represents a 102.9-million-pound decrease (18 percent) from the amount of carcinogens reported in 1987. The top 25 carcinogens with the largest releases and transfers accounted for 98 percent of all TRI individually listed carcinogens. The top ten carcinogens accounted for almost 82 percent. (See Table 4-11.)

Carcinogens comprised 8% of the TRI total releases and transfers.

TABLE 4-11. Environmental Distribution of the 25 Carcinogens with the Largest TRI Releases and Transfers, 1988.

CARICINOGEN RANK 1988	CARICINOGEN RANK 1987	CHEMICAL	TRI TOTAL Pounds	AIR Percent	SURFACE WATER Percent	LAND Percent	UNDER-GROUND Percent	PUBLIC SEWAGE Percent	OFF-SITE Percent
1	1	DICHLOROMETHANE	134,212,442	85.54	0.20	0.11	0.23	1.90	12.01
2	2	STYRENE	42,760,770	78.61	0.14	0.57	0.00	0.69	19.99
3	4	TETRACHLOROETHYLENE	35,879,858	86.45	0.10	0.29	0.20	1.45	11.51
4	5	BENZENE	33,245,252	85.09	0.14	0.67	1.91	3.32	8.87
5	7	FORMALDEHYDE	30,766,305	40.08	0.00	2.49	31.23	14.53	8.74
6	6	CHLOROFORM	26,604,039	85.36	4.11	0.26	0.14	4.61	5.52
7	10	ACETONITRILE	23,585,619	8.67	0.18	0.01	70.92	1.86	18.36
8	9	ASBESTOS (FRIABLE)	22,607,674	0.19	0.05	4.49	0.42	0.09	94.76
9	3	LEAD	22,434,784	4.31	0.53	36.99	0.00	0.49	57.69
10	8	CHROMIUM	21,296,563	2.19	0.39	43.56	0.13	2.35	51.38
11	13	ACRYLONITRILE	10,841,495	38.95	0.05	0.02	42.09	8.82	10.08
12	19	POLYCHLORINATED BIPHENYLS	9,286,906	0.00	0.00	0.04	0.00	0.32	99.65
13	11	NICKEL	8,999,971	3.75	0.96	11.28	0.16	2.57	81.28
14	12	1,2-DICHLOROETHANE	7,567,049	53.03	0.52	0.03	16.16	2.34	27.93
15	14	1,3-BUTADIENE	7,212,227	88.72	5.72	0.11	0.00	0.62	4.83
16	16	CARBON TETRACHLORIDE	5,085,155	74.02	0.31	0.29	1.93	0.10	23.35
17	15	BETHYLENE OXIDE	5,053,707	90.86	0.88	1.08	0.22	6.52	0.43
18	17	PROPYLENE OXIDE	4,625,911	64.09	2.43	0.21	24.08	8.80	0.38
19	18	DI-(2-ETHYLHEXYL) PHTHALATE	3,506,080	31.07	0.09	0.58	0.09	5.74	62.43
20	21	VINYL CHLORIDE	2,072,382	66.97	0.10	0.11	0.00	0.83	32.00
21	26	1,4-DICHLOROBENZENE	2,007,383	90.08	0.31	0.05	0.75	1.89	6.92
22	20	ISOPROPYL ALCOHOL	1,672,949	68.29	0.00	0.00	0.00	4.24	27.47
23	27	1,4-DIOXANE	1,092,862	48.84	17.48	0.05	0.00	14.37	19.26
24	28	ACRYLAMIDE	1,032,887	2.52	0.30	0.07	85.10	1.31	10.70
25	33	HEXACHLOROBENZENE	970,287	0.51	0.00	0.00	0.04	0.02	99.43
		SUBTOTAL	464,420,557	59.98	0.77	4.58	7.63	3.00	24.04
		TOTAL FOR OTHER CARCINOGENS	7,216,203	35.53	0.85	4.73	11.34	9.6	37.96
		CARCINOGEN TOTAL	471,636,760	59.61	0.77	4.59	7.69	3.10	24.25
		GRAND TOTAL	6,241,030,746	38.9	5.79	9.00	19.46	9.14	17.70

BOX 4-F. TRI CARCINOGENS

For the purposes of TRI reporting, EPA is using a list of carcinogens adopted from standards developed by the U.S. Occupational Safety and Health Administration (OSHA). This list is only one of many in use in environmental and scientific communities to identify carcinogens. Each list relies on somewhat different criteria as to which chemicals are or are not carcinogens (for instance, some require a greater *weight of evidence* than others that a chemical has been confirmed as a carcinogen). Indeed, at least 24 TRI chemicals which *do not* appear on the OSHA list as a carcinogen are nevertheless classified as carcinogens in other EPA programs. The most significant chemical in this category is trichloroethylene, which ranks 24th in terms of total TRI releases and transfers (52 million pounds). It is not listed as a carcinogen under TRI due to uncertainty regarding the experimental and epidemiological evidence linking this chemical to any carcinogenic effects. However, trichloroethylene is treated as a carcinogen under other regulatory programs.

Users of TRI data should also be aware that some of the individual chemicals included in the TRI chemical categories may also be carcinogenic. For instance, some lead compounds are considered carcinogens, while others are not. Since the chemical categories group together many individual compounds in a single data set, there is no way of knowing how much of any given category consists of carcinogenic compounds. Hence, these data are not included as carcinogens in this report.

BOX 4-G. TOXICITY: Additional Complexities

This chapter summarizes the toxcity of TRI releases and transfers based on several different EPA lists of chemical toxicity, suggesting the nature of toxic effects that could be caused by TRI releases. However, such lists invariably oversimplify reality. For example, some chemicals are significantly more potent than others. The TRI chemical carbon disulfide is considered to be 20 times more potent than xylene when chronic exposure occurs by ingestion (orally through eating, drinking, or swallowing). Both were among the top-ranked TRI chemicals, with total releases and transfers of 181.8 million (xylene) and 82.7 million (carbon disulfide). Yet carbon disulfide is much more potent. Therefore, depending on the degree and type of exposure to these two chemicals that occurs, one might be more concerned about exposure to carbon disulfide than to xylene.

Furthermore, the same chemical may be more potent through one exposure route (such as inhalation) than another (such as absorption through the skin). For example, tetrachloroethylene is 15 times more potent when ingested than when inhaled, and nickel causes cancer when inhaled, but not when ingested. Clearly, exposure data is vital to estimating the risks of TRI release. In the case of nickel, only 2.4 percent (246,000 out of 10.4 million pounds) of its TRI total consisted of air emissions.

Chemical form is also important. For example, only the fibrous mineral form of asbestos is associated with cancer. Likewise, only the hexavalent (not the trivalent) forms of chromium are considered carcinogenic and, then, only if inhaled. Therefore, the summaries presented in this report, based upon the various toxicity lists, provide only part of the story and should be used with care.

Dichloromethane is the one chemical among the top 25 TRI chemicals with the largest releases and transfers that is a listed carcinogen. Total releases and transfers of dichloromethane far exceeded releases of other carcinogens, accounting for greater than 28 percent (134.2 million pounds) of the carcinogen total. Releases and transfers of styrene, the second ranked carcinogen, accounted for only about nine percent (42.8 million pounds) of all carcinogen releases and transfers. (See Tables 4–10 and 4–11.)

Dichloromethane was the carcinogen released and transferred in the greatest amounts.

Lead and dichloromethane were the carcinogens that decreased the most. Of the top 25 carcinogens, lead and dichloromethane had the largest decreases in releases and transfers from 1987 with decreases of 25.2 million and 21.4 million pounds, respectively. This represents a 53-percent decrease for lead and a 14-percent-decrease in the case of dichloromethane. (See Table 4–12.)

Table 4–12. The 25 Carcinogens with the Largest TRI Releases and Transfers for 1988 Compared to 1987.

CARCINOGEN RANK		CHEMICAL	1988 RELEASES AND TRANSFERS		1987 RELEASES AND TRANSFERS	
1988	1987		Pounds	Percent	Pounds	Percent
1	1	DICHLOROMETHANE	134,212,442	28.46	155,627,785	27.09
2	2	STYRENE	42,760,770	9.07	59,433,848	10.34
3	4	TETRACHLOROETHYLENE	35,879,858	7.61	43,176,096	7.51
4	5	BENZENE	33,245,252	7.05	32,907,928	5.73
5	7	FORMALDEHYDE	30,766,305	6.52	27,584,523	4.80
6	6	CHLOROFORM	26,604,039	5.64	30,522,680	5.31
7	10	ACETONITRILE	23,585,619	5.00	22,774,488	3.96
8	9	ASBESTOS (FRIABLE)	22,607,674	4.79	24,522,197	4.27
9	3	LEAD	22,434,784	4.76	47,615,994	8.29
10	8	CHROMIUM	21,296,563	4.52	25,458,368	4.43
11	13	ACRYLONITRILE	10,841,495	2.30	11,250,310	1.96
12	19	POLYCHLORINATED BIPHENYLS	9,286,906	1.97	3,678,300	0.64
13	11	NICKEL	8,999,971	1.91	17,165,365	2.99
14	12	1,2-DICHLOROETHANE	7,567,049	1.60	16,133,754	2.81
15	14	1,3-BUTADIENE	7,212,227	1.53	9,922,040	1.73
16	16	CARBON TETRACHLORIDE	5,085,155	1.08	6,608,570	1.15
17	15	ETHYLENE OXIDE	5,053,707	1.07	6,923,358	1.20
18	17	PROPYLENE OXIDE	4,625,911	0.98	4,367,762	0.76
19	18	DI-(2-ETHYLHEXYL) PHTHALATE	3,506,080	0.74	4,107,920	0.71
20	21	VINYL CHLORIDE	2,072,382	0.44	2,838,389	0.49
21	26	1,4-DICHLOROBENZENE	2,007,383	0.43	1,437,375	0.25
22	20	ISOPROPYL ALCOHOL	1,672,949	0.35	3,128,741	0.54
23	27	1,4-DIOXANE	1,092,862	0.23	1,267,687	0.22
24	28	ACRYLAMIDE	1,032,887	0.22	1,001,660	0.17
25	33	HEXACHLOROBENZENE	970,287	0.21	659,288	0.11
		SUBTOTAL	464,420,557	98.47	560,114,426	97.49
		TOTAL FOR OTHER CARCINOGENS	7,216,203	1.53	14,438,952	2.51
		CARCINOGEN TOTAL	471,636,760	100.00	574,553,378	100.00
		GRAND TOTAL	6,241,030,746		6,977,432,542	

Table 4-13. The 10 States with the Largest TRI Releases and Transfers of Selected Carcinogens*, 1988.

CARCINOGEN RANK 1988	CARCINOGEN RANK 1987	CHEMICAL	Texas Pounds	Ohio Pounds	Louisiana Pounds	New York Pounds	Indiana Pounds
1	1	DICHLOROMETHANE	3,327,387	5,346,996	376,373	17,359,940	14,634,926
2	2	STYRENE	4,331,344	5,005,040	690,081	323,857	2,356,129
3	4	TETRACHLOROETHYLENE	714,204	3,449,582	590,446	3,219,553	2,889,174
4	5	BENZENE	6,962,482	1,808,842	1,295,249	1,547,557	3,326,095
5	7	FORMALDEHYDE	6,881,160	1,763,550	5,259,166	942,340	474,341
6	6	CHLOROFORM	1,084,857	148,689	1,421,448	68,817	12,285
7	10	ACETONITRILE	3,353,502	2,191,185	12,087,240	275,161	2,419,214
8	9	ASBESTOS (FRIABLE)	1,060,600	932,732	1,040,996	5,640,607	212,203
9	3	LEAD	3,253,111	3,163,475	617,336	516,222	677,015
10	8	CHROMIUM	630,202	4,760,916	39,608	229,447	575,210
		SUBTOTAL	31,598,849	28,571,007	23,417,943	30,123,501	27,576,592
		TOTAL FOR ALL OTHERS	14,375,749	5,505,247	8,113,169	951,830	1,487,310
		GRAND TOTAL	45,974,598	34,076,254	31,531,112	31,075,331	29,063,902
		PERCENT OF STATE TOTAL	6.35	9.06	4.25	18.06	10.52

*The 10 carcinogens with the largest TRI total releases and transfers.

60% of the top 25 carcinogens was emitted to air.

Approximately 60 percent of the total amount of the top 25 carcinogens was emitted to air, and another 24 percent was transferred off-site to treatment, storage, and disposal facilities. Many TRI carcinogens are organic or halo-organic chemicals which, as mentioned above, are often quite volatile. Thus, it is not surprising that the majority of releases are to air.

The number of pounds of a chemical that are released cannot be translated directly into a quantitative assessment of risk to humans or other organisms. Route of exposure is also important. For example, compare the releases and transfers of carcinogens such as chromium and nickel. Approximately 21.3 million pounds of chromium and 9.0 million pounds of nickel were released or transferred in 1988. (These amounts do not include releases and transfers for chromium and nickel compounds.) Both of these chemicals are only associated with carcinogenic effects when exposure occurs via inhalation. Given this consideration, it is important to note that only a very small percentage of each is released to air (two percent for chromium and four percent for nickel). Therefore, the potential for releases of these two chemicals to pose a carcinogenic risk to the population appears to be significantly less than what one might think if one were to focus only on the total amount of releases and transfers. (See Table 4-11 and Box 4-G.)

Table 4-13, continued.

CHEMICAL	Pennsylvania Pounds	California Pounds	Michigan Pounds	Illinois Pounds	Tennessee Pounds
DICHLOROMETHANE	4,617,071	7,368,021	8,260,531	4,443,937	2,792,920
STYRENE	1,351,799	2,007,158	4,032,972	2,310,047	2,014,018
TETRACHLOROETHYLENE	1,089,194	5,054,221	809,393	2,216,062	599,496
BENZENE	3,853,006	425,097	907,429	1,836,797	222,590
FORMALDEHYDE	2,047,258	598,246	1,823,246	534,845	38,716
CHLOROFORM	706,032	753,731	352,465	68,476	382,700
ACETONITRILE	142,850	10,665	570,210	62,151	0
ASBESTOS (FRIABLE)	1,676,756	3,411,963	533,785	1,990	5,885,555
LEAD	863,774	1,434,463	348,905	1,287,312	756,621
CHROMIUM	4,276,359	242,889	1,463,571	1,073,604	150,690
SUBTOTAL	20,624,099	21,306,454	19,102,507	13,835,221	12,843,306
TOTAL FOR ALL OTHERS	3,488,708	2,294,974	3,118,804	3,417,700	2,086,612
GRAND TOTAL	24,112,807	23,601,428	22,221,311	17,252,921	14,929,918
PERCENT OF STATE TOTAL	11.99	11.71	9.59	6.87	5.99

Geographical Distribution of Carcinogens

Facilities in all jurisdictions except the District of Columbia and American Samoa reported some releases and transfers of carcinogens for 1988. The top ten states accounted for 58 percent (or 273.8 million pounds) of the carcinogen total. Texas facilities released and transferred the most carcinogens, accounting for ten percent (46.0 million pounds) of the total carcinogens released or transferred. Ohio ranked second, with a total of 34.1 million pounds of carcinogens, and Louisiana ranked third, with 31.5 million pounds. (See Table 4–13.)

Texas manufacturers generated most carcinogens, accounting for 10% of the national carcinogen total.

The top ten states differed significantly in the amounts of the individual carcinogens each released and transferred. New York manufacturer, which generated the fourth-ranked amount of carcinogens, released the greatest amount of dichloromethane—17.4 million pounds, with Indiana contributing another 14.6 million pounds. Third-ranked Louisiana, only released 376,000 pounds of dichloromethane. New York had the largest percentage (18 percent) of carcinogens among its total releases and transfers. (See Table 4–14.)

The top states differed significantly in the amounts of the individual carcinogens each released and transferred.

New York manufacturers released or transferred the most dichloromethane (17.4 million pounds), accounting for 13 percent of the total amount. Ohio facilities released the most styrene and chromium, accounting for 12 and 22 percent of the total releases and transfers of these chemicals, respectively. Facilities in California released the most tetrachloroethylene accounting for 14 percent of the total amount. Texas facilities released the most benzene, formaldehyde, and lead

New York manufacturers released and transferred 13% of the nationwide total of dichloromethane.

Table 4–14. Environmental Distribution of TRI Releases and Transfers for the Top State for the Top 10 Carcinogens, 1988.

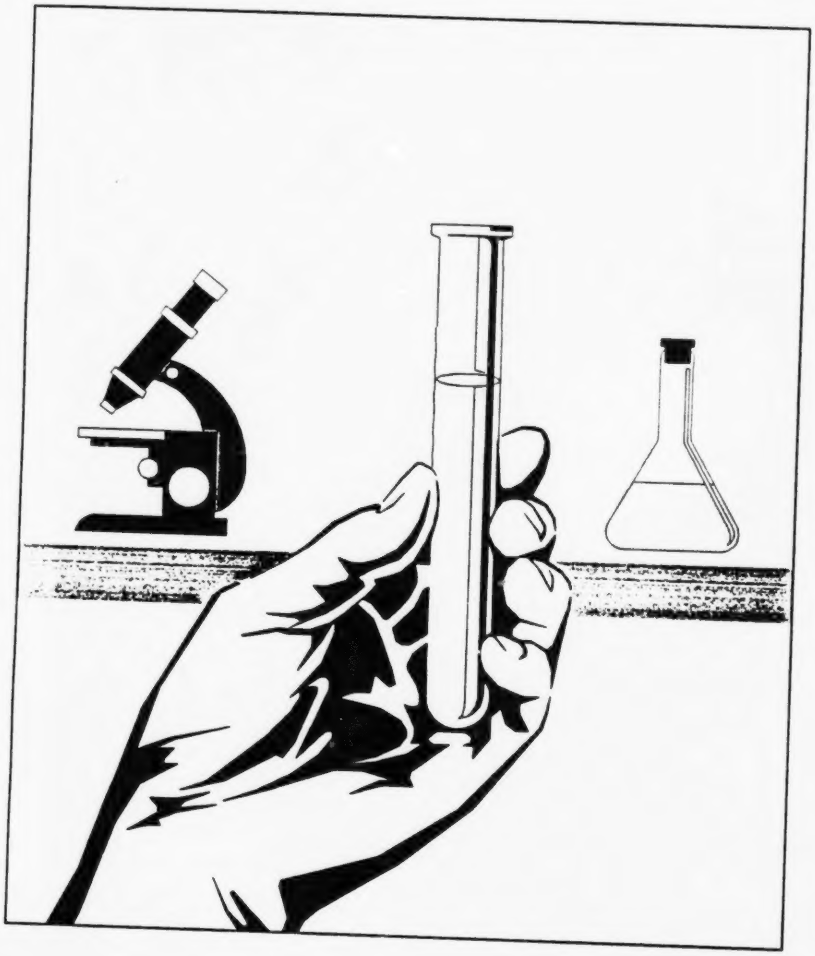
1988 RANK	CHEMICAL	STATE	TOTAL RELEASES AND TRANSFERS Pounds	AIR Percent	WATER Percent	LAND Percent	UNDER-GROUND Percent	PUBLIC SEWAGE Percent	OFF-SITE Percent
1	DICHLOROMETHANE	New York	17,359,940	84.40	0.12	0.69	0.00	8.60	6.18
2	STYRENE	Ohio	5,005,040	59.17	0.01	0.35	0.00	1.16	39.31
3	TETRACHLOROETHYLENE	California	5,054,221	91.00	0.00	0.47	0.00	0.02	8.51
4	BENZENE	Texas	6,962,482	73.05	0.26	2.39	8.19	3.28	12.83
5	FORMALDEHYDE	Texas	6,881,160	19.80	0.10	0.07	78.42	0.70	0.92
6	CHLOROFORM	Alabama	2,389,139	97.02	2.66	0.21	0.00	0.00	0.11
7	ACETONITRILE	Louisiana	12,087,240	1.22	0.02	0.00	98.45	0.00	0.30
8	ASBESTOS (FRIABLE)	Tennessee	5,885,555	0.18	0.00	0.00	0.00	0.00	99.82
9	LEAD	Texas	3,253,111	2.78	0.18	91.25	0.00	0.12	5.67
10	CHROMIUM	Ohio	4,760,916	2.03	0.06	68.57	0.00	0.41	28.92

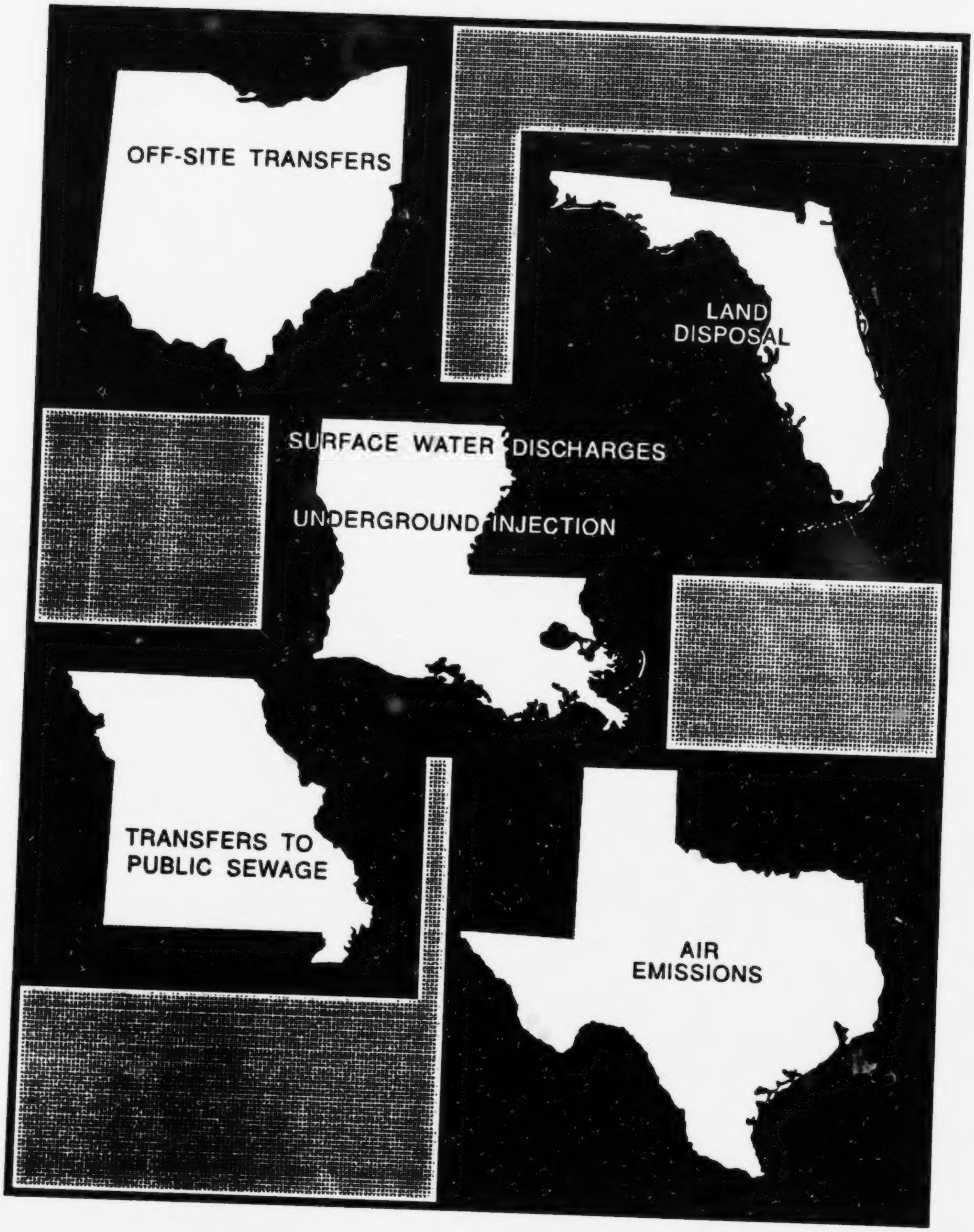
accounting for 21 percent, 22 percent, and 15 percent of the respective totals for each. (See Table 4–14.)

Potential for Exposure to Top Carcinogens

The top four (dichloromethane, styrene, tetrachloroethylene, benzene), are released primarily to the air, as is chloroform. Because air pollutants often disperse over a wider geographical area than those released to other environmental media, it is possible that a relatively larger population may be exposed to any one of these chemicals. It is also possible that facilities may emit several carcinogenic chemicals to air and therefore, people may be exposed to multiple carcinogens. If these releases are concentrated in certain localities, the potential for cancer in the exposed population may be greater than if releases were dispersed over a large geographical area.

The following chapters detail the geographical and industrial distribution of the chemicals discussed here—both carcinogenic and noncarcinogenic—and subsequent chapters focus on specific increases and decreases of chemicals released to air, land, or water or transferred off-site. In all cases, readers should remember that national aggregates do not directly indicate risks. TRI does, however, offer detailed information that can be used to examine risks at the local level.




OFF-SITE TRANSFERS
LAND DISPOSAL
SURFACE WATER DISCHARGES
UNDERGROUND INJECTION
TRANSFERS TO PUBLIC SEWAGE
AIR EMISSIONS

CHAPTER 5. THE GEOGRAPHY OF TOXIC RELEASES AND TRANSFERS, 1988

OVERALL DISTRIBUTION

States

Louisiana facilities reported the largest total releases and transfers of TRI chemicals in 1988. Louisiana's 741.2 million pounds of TRI releases and transfers represented 12 percent of the TRI total nationwide. Facilities in four parishes[1] (Jefferson, Saint Charles, Saint James, and Ascension) generated 85 percent of the state's total. The releases and transfers in Jefferson and Saint James parishes were in turn almost exclusively due to releases and transfers from the two top-ranked facilities in the nation for total releases and transfers: an American Cyanamid plant (City of Westwego, Jefferson Parish), that released and transferred 176.4 million pounds of TRI chemicals in 1988 and a Shell Oil Company facility (City of Norco, Saint Charles Parish) that released and transferred 158.7 million pounds in 1988. (See Map 5-1 and Table 5-1.)

Facilities in Louisiana and Texas together generated 24% of the national TRI total for 1988.

Texas ranked second for total quantities of releases and transfers with 724.5 million pounds, or 12 percent of the national total. One quarter of Texas's total came from facilities in Jefferson County, Texas, which were dominated by the facility with the third largest releases and transfers in the nation: the Du Pont Company facility in Beaumont reporting 111.9 million pounds of releases and transfers. (However, corrections to the database made after the data for this report was compiled added 100 million pounds of underground injection releases at this facility, which boosts Texas to first place for TRI totals, above Louisiana. (See Box 3-C in Chapter 3.)

Altogether, the ten states with the largest TRI releases and transfers accounted for 56 percent of the national total. Among the jurisdictions with the smallest quantities of TRI emissions were American Samoa and the District of Columbia, with 30,000 and 1,000 pounds of TRI releases and transfers, respectively. (See Figure 5-1.)

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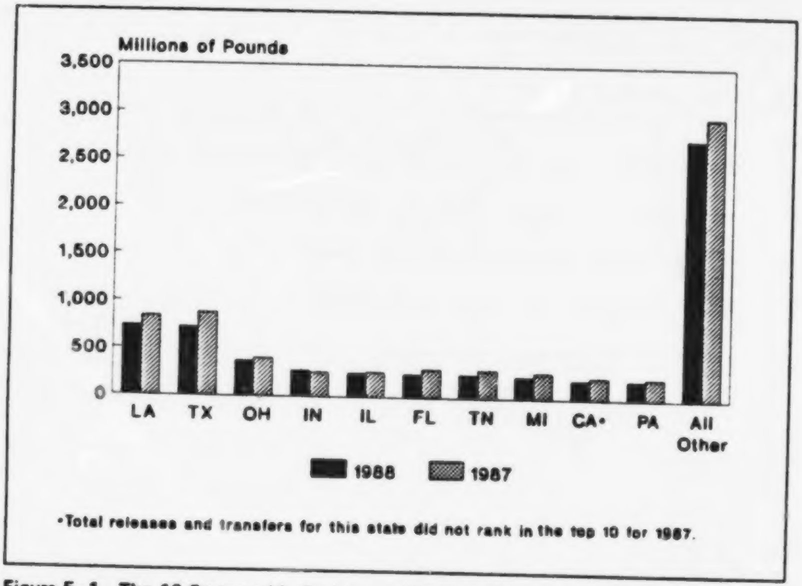
(1) Instead of dividing jurisdictions into counties, Louisiana designates "parishes," which are similar to counties in other states.

Table 5-1. Average and Total Releases and Transfers by State, 1988.

STATE	FACILITIES	FORMS	TOTAL RELEASES AND TRANSFERS		AVERAGE PER FACILITY*	
	Number	Number	Pounds	Rank	Pounds	Rank
Alabama	382	1,549	84,062,842	22	220,060	25
Alaska	6	45	26,476,465	38	4,412,744	1
American Samoa	2	3	29,500	53	14,750	53
Arizona	166	534	74,657,306	24	449,743	15
Arkansas	304	988	72,272,458	25	237,738	23
California	1,655	5,350	201,568,789	9	121,794	46
Colorado	170	496	21,132,981	42	124,312	44
Connecticut	403	1,358	53,449,946	30	132,630	43
Delaware	56	223	10,692,005	46	190,929	33
District of Columbia	1	1	1,000	54	1,000	54
Florida	467	1,307	249,655,746	6	534,595	11
Georgia	598	1,984	131,410,860	18	219,751	26
Hawaii	24	86	2,964,331	49	123,514	45
Idaho	48	146	15,105,613	44	314,700	19
Illinois	1,229	4,375	251,302,153	5	204,477	29
Indiana	756	2,853	276,346,921	4	365,538	18
Iowa	331	1,025	58,668,674	28	177,247	34
Kansas	186	712	174,468,243	13	938,001	7
Kentucky	298	1,303	131,319,642	19	440,670	16
Louisiana	286	1,833	741,206,814	1	2,591,632	2
Maine	98	351	21,965,123	41	224,134	24
Maryland	195	713	33,340,174	36	170,975	36
Massachusetts	587	1,746	70,821,565	26	120,650	47
Michigan	790	3,249	231,681,301	8	293,267	20
Minnesota	330	1,081	65,506,519	27	198,505	30
Mississippi	248	843	120,820,916	20	487,181	12
Missouri	495	1,810	184,627,555	12	372,985	17
Montana	24	121	35,467,330	34	1,477,805	5
Nebraska	134	387	22,649,337	40	169,025	38
Nevada	34	93	4,874,292	47	143,362	42
New Hampshire	137	366	15,171,504	43	110,741	48
New Jersey	824	2,845	162,741,774	15	197,502	31
New Mexico	34	129	24,398,821	39	717,612	8
New York	816	2,700	172,106,105	14	210,914	28
North Carolina	805	2,689	136,857,071	17	170,009	37
North Dakota	28	67	1,394,580	52	49,806	51
Ohio	1,360	5,054	375,989,294	3	276,463	22
Oklahoma	182	668	51,720,309	31	284,178	21
Oregon	194	662	33,604,243	35	173,218	35
Pennsylvania	1,030	3,862	201,102,129	10	195,245	32
Puerto Rico	171	530	28,842,935	37	168,672	39
Rhode Island	188	517	12,568,955	45	66,856	50
South Carolina	375	1,488	82,177,534	23	219,140	27
South Dakota	41	71	3,059,629	48	74,625	49
Tennessee	517	1,736	249,417,227	7	482,432	14
Texas	1,089	5,264	724,477,706	2	665,269	9
Utah	111	416	137,472,389	16	1,238,490	6
Vermont	55	151	2,374,596	50	43,174	52
Virgin Islands	1	18	1,633,634	51	1,633,634	4
Virginia	405	1,425	196,619,903	11	485,481	13
Washington	305	950	50,338,221	32	165,043	40
West Virginia	101	606	57,901,379	29	573,281	10
Wisconsin	664	2,237	105,049,429	21	158,207	41
Wyoming	26	115	45,464,978	33	1,748,653	3
TOTAL	19,762	71,131	6,241,030,746		315,810	

* Average total releases and transfers per facility.



*Total releases and transfers for this state did not rank in the top 10 for 1987.

Figure 5-1. The 10 States with the Largest TRI Total Releases and Transfers for 1988 Compared to 1987.

Counties

TRI state totals were often concentrated in one or a few counties. In fact, facilities in 25 counties (out of a nationwide total of more than 3,000 [2]) accounted for 37 percent of all TRI releases and transfers in the nation. Facilities in Jefferson and Saint Charles Parishes, Louisiana, led the nation's counties in total releases and transfers in 1988—as they did in 1987—with 181.2 and 173.5 million pounds of total emissions respectively. These two counties accounted for 48 percent of Louisiana's total and six percent of the national total. The third ranked county for total releases and transfers, Sedgwick County, Kansas, released 85 percent of its state's total. (See Table 5-2; compare Maps 5-1 and 5-2.)

More than 1/3 of the TRI total originated in just 25 counties.

Five Texas counties were among the top 25, and accounted for 73 percent of total releases and transfers in Texas. Louisiana had four counties in the top 25; releases and transfers from the four accounted for 85 percent of the state's total. Together, Texas and Louisiana had seven of the top ten counties and nine of the top 25. Facilities in two counties (in addition to Sedgwick, Kansas) released or transferred

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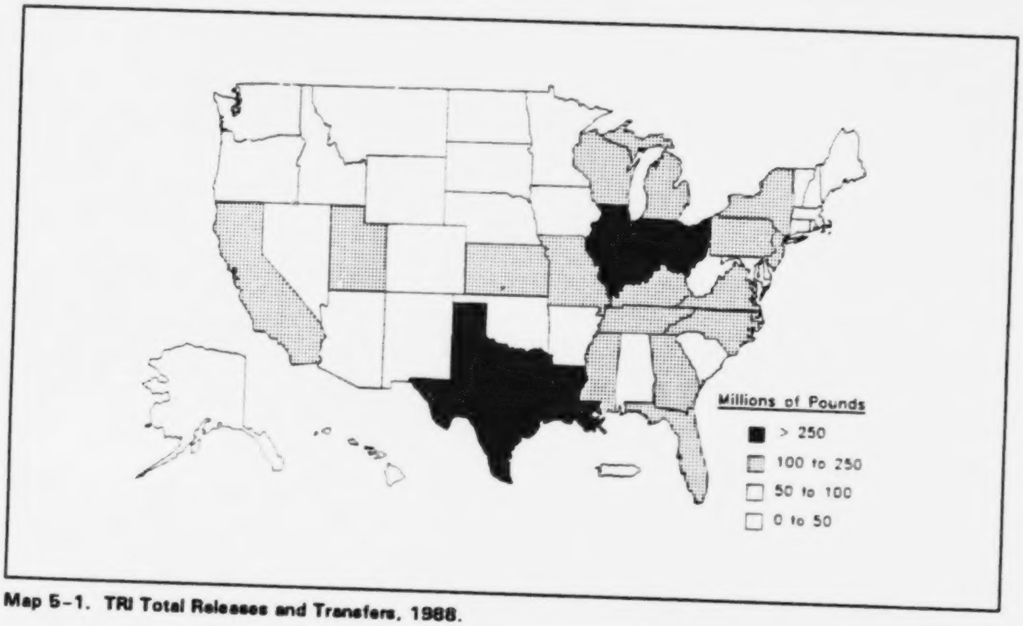
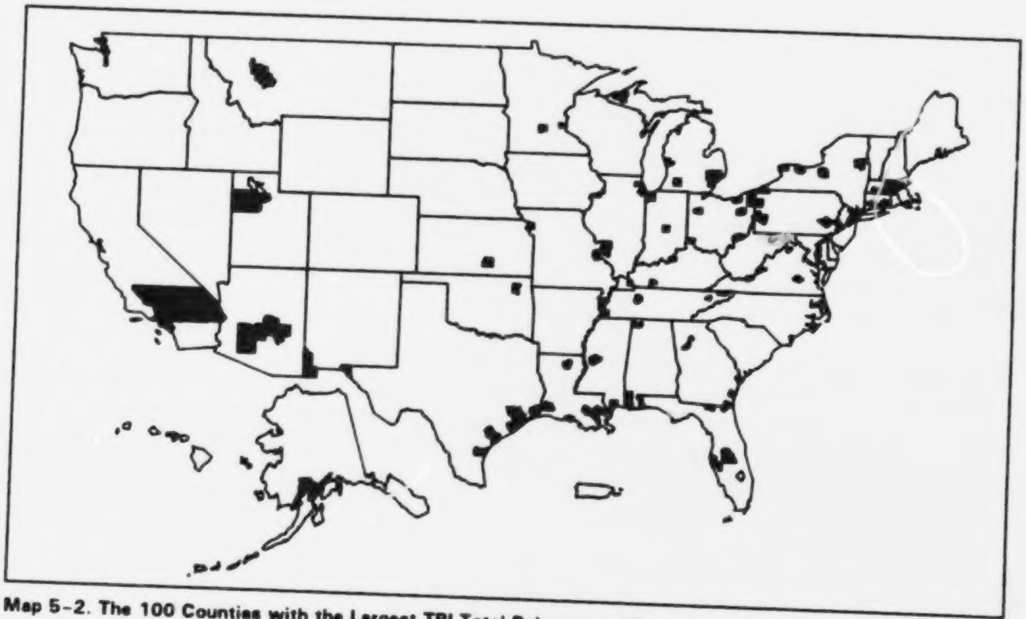
(2) The term "counties" in this report includes counties, parishes, and similar governmental jurisdictions such as independent cities that are not incorporated into any county.


Millions of Pounds
■ > 250
▨ 100 to 250
☐ 50 to 100
☐ 0 to 50

Map 5-1. TRI Total Releases and Transfers, 1988.



Map 5-2. The 100 Counties with the Largest TRI Total Releases and Transfers, 1988.

Table 5-2. The 25 Counties with the Largest TRI Total Releases and Transfers, 1988.

TRI TOTAL RANK	COUNTY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	PERCENT OF TRI TOTAL	PERCENT OF STATE TOTAL
1	JEFFERSON	LA	181,183,417	2.90	24.44
2	ST CHARLES	LA	173,516,006	2.78	23.41
3	SEDGWICK	KS	148,451,613	2.38	85.09
4	JEFFERSON	TX	145,089,539	2.32	20.03
5	ST JAMES	LA	136,909,204	2.19	18.47
6	ASCENSION	LA	136,879,232	2.19	18.47
7	HARRIS	TX	123,661,545	1.98	17.07
8	BRAZORIA	TX	122,892,064	1.97	16.96
9	TOOELE	UT	109,750,090	1.76	79.83
10	LAKE	IN	91,319,837	1.46	33.05
11	LOS ANGELES	CA	89,930,560	1.44	44.62
12	CALHOUN	TX	83,004,046	1.33	11.46
13	WAYNE	MI	75,863,321	1.22	32.74
14	ST LOUIS	MO	71,819,308	1.15	38.90
15	COOK	IL	67,657,587	1.08	26.92
16	ALLEN	OH	61,325,655	0.98	16.31
17	HOPEWELL CITY	VA	59,390,698	0.95	30.21
18	HUMPHREYS	TN	59,237,973	0.95	23.75
19	GALVESTON	TX	57,911,864	0.93	7.99
20	NASSAU	FL	57,138,140	0.92	22.89
21	GILA	AZ	52,868,172	0.85	70.81
22	HAMILTON	FL	50,342,021	0.81	20.16
23	ST CLAIR	IL	50,016,783	0.80	19.90
24	HARRISON	MS	49,262,748	0.79	40.77
25	UNION	NJ	47,309,096	0.76	29.07
	SUBTOTAL		2,302,730,519	36.90	
	TOTAL FOR ALL OTHERS		3,938,300,227	63.10	
	GRAND TOTAL		6,241,030,746	100.00	

over half of their state's total: Tooele County, Utah, accounted for 80 percent of Utah's total and Gila County, Arizona, accounted for 71 percent of Arizona's total.

Counties generally ranked high because a few individual facilities generated large releases and transfers.

In most cases, only a handful of individual facilities account for the majority of the releases and transfers within the top-ranked counties. Indeed, only four counties that ranked high for total releases and transfers also ranked high for total number of facilities reporting (Los Angeles, California, with 641 facilities; Cook County, Illinois, with 552 facilities; Harris County, Texas, with 222 facilities and Wayne County, Michigan, with 148 facilities). The top five counties accounted for 13 percent of all releases and transfers nationwide, and just 11 facilities within these counties are responsible for 80 percent and more of these releases and transfers—ten percent of the national total. (See Table 5-3.)

Table 5-3. Major Facilities in the 5 Counties with the Largest TRI Total Releases and Transfers, 1988.

COUNTY	STATE	MAJOR FACILITY(IES)	CITY	RELEASES AND TRANSFERS Pounds	PERCENT OF COUNTY TOTAL
JEFFERSON	LA	AMERICAN CYANAMID	WESTWEGO	176,418,250	97.37
ST CHARLES	LA	SHELL OIL CO.	NORCO	158,662,990	
		MONSANTO CO.	LULING	8,127,468	
		WITCO CORP.-ARGUS DIV.	HAHNVILLE	5,203,384	
			SUBTOTAL	171,993,842	99.12
SEDGWICK	KS	VULCAN CHEMICALS	WICHITA	92,011,960	
		RACON INC.	WICHITA	51,215,854	
			SUBTOTAL	143,227,814	96.48
JEFFERSON	TX	DU PONT BEAUMONT WORKS	BEAUMONT	111,899,929	
		OLIN CORP. BEAUMONT PLANT	BEAUMONT	4,156,191	
			SUBTOTAL	116,056,120	79.99
ST JAMES	LA	FREEPORT MCMORAN-AGRICO DIV	UNCLE SAM	63,327,150	
		FREEPORT MCMORAN-AGRICO DIV	DONALDSONVILLE	61,820,000	
		TEXACO REFINING & MARKETING	CONVENT	10,146,715	
			SUBTOTAL	135,293,865	98.82
		TOTAL FOR 11 FACILITIES		742,989,891	

Cities

42% of the 1988 TRI total came from facilities in 50 cities.

The localized concentrations of TRI state totals are further shown by the fact that facilities in just 50 U.S. cities accounted for 2.6 billion pounds, or 42 percent, of the total national TRI releases and transfers in 1988.[3] These 50 cities included only seven percent of the total TRI facilities nationwide, however. (See Table 5-4.)

As in 1987, the most-highly industrialized cities—those with the most facilities reporting to TRI—were not always those with the largest releases and transfers. A small number of large facilities in some cities reported large emissions of a small number of chemicals. For example, a single facility, Phelps Dodge Mining Co., in Playas, New Mexico, (which ranked 40th with 22.8 million pounds of releases and transfers) not only accounted for all of the city's releases and transfers, but also for 94 percent of the state's releases and transfers in 1988. In contrast, 250 facilities in 29th-ranked Chicago, Illinois, reported a total of 30

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(3) TRI facilities report individual city names, rather than standard metropolitan statistical areas (SMSAs) which include a city and its surrounding suburbs. Facilities in large metropolitan areas may be located in any of various suburbs, each with different names. Thus, many large metropolitan areas do not appear on the list because the reporting TRI facilities are scattered in suburbs with different names.

Table 5-4. The 50 Cities with the Largest TRI Total Releases and Transfers, 1988.

RANK	CITY	COUNTY	STATE	FACILITIES Number	FORMS Number	TOTAL RELEASES AND TRANSFERS Pounds	PERCENT OF STATE TOTAL	PERCENT OF TRI TOTAL
1	WESTWEGO	JEFFERSON	LA	3	27	176,418,753	23.80	2.83
2	NORCO	ST CHARLES	LA	2	27	158,664,408	21.41	2.54
2	WICHITA	SEDGWICK	KS	35	161	148,450,972	85.09	2.38
4	BEAUMONT	JEFFERSON	TX	16	202	132,331,426	18.27	2.12
5	TOOELE	TOOELE	UT	1	6	109,750,090	79.83	1.76
6	ALVIN	BRAZORIA	TX	4	55	107,358,017	14.82	1.72
7	DONALDSONVILLE	ST JAMES/ASCENSION	LA	5	32	105,412,434	14.22	1.69
8	GEISMAR	ASCENSION	LA	9	157	93,083,044	12.56	1.49
9	PORT LAVACA	CALHOUN	TX	2	42	81,360,716	11.23	1.30
10	SAINT LOUIS	SAINT LOUIS CITY	MO	119	462	74,809,580	40.52	1.20
11	EAST CHICAGO	LAKE	IN	8	62	69,756,347	25.24	1.12
12	UNCLE SAM	ST JAMES	LA	1	5	63,327,150	8.54	1.01
13	LIMA	ALLEN	OH	9	73	61,283,504	16.30	0.98
14	HOPEWELL	HOPEWELL CITY	VA	8	50	59,797,800	30.41	0.96
15	NEW JOHNSONVILLE	HUMPHREYS	TN	4	21	59,224,673	23.75	0.95
16	TEXAS CITY	GALVESTON	TX	8	174	57,710,326	7.97	0.92
17	FERNANDINA BEACH	NASSAU	FL	2	19	57,138,140	22.89	0.92
18	WHITE SPRINGS	HAMILTON	FL	1	4	50,342,021	20.16	0.81
19	PASS CHRISTIAN	HARRISON	MS	1	7	49,061,860	40.61	0.79
20	PASADENA	HARRIS	TX	38	340	48,961,897	6.76	0.78
21	LOUISVILLE	JEFFERSON	KY	56	323	46,974,010	35.77	0.75
22	KINGSPORT	SULLIVAN	TN	7	107	44,843,679	17.98	0.72
23	FRONT ROYAL	WARREN	VA	3	26	39,336,058	20.01	0.63
24	CANTONMENT	ESCAMBIA	FL	4	30	37,481,634	15.01	0.60
25	HAYDEN	GILA	AZ	1	8	35,930,150	48.13	0.58
26	MEMPHIS	SHELBY	TN	69	276	34,587,975	13.87	0.55
27	EAST HELENA	LEWIS AND CLARK	MT	2	12	32,984,278	93.00	0.53
28	ECORSE	WAYNE	MI	2	25	30,016,393	12.96	0.48
29	CHICAGO	COOK	IL	250	838	29,948,908	11.92	0.48
30	ELIZABETH	UNION	NJ	10	52	29,929,473	18.39	0.48
31	PORTAGE	PORTER	IN	2	9	29,411,465	10.64	0.47
32	HERCULANEUM	JEFFERSON	MO	1	5	28,890,351	15.65	0.46
33	CHEYENNE	LARAMIE	WY	2	27	28,628,676	62.97	0.46
34	ROCHESTER	MONROE	NY	49	236	28,403,969	16.50	0.46
35	CAHOKIA	ST CLAIR	IL	1	18	26,346,278	10.48	0.42
36	VERNON	LOS ANGELES	CA	16	47	25,483,751	12.64	0.41
37	CINCINNATI	HAMILTON	OH	114	416	24,502,201	6.52	0.39
38	ASHTABULA	ASHTABULA	OH	19	80	23,781,355	6.33	0.38
39	CLEVELAND	CUYAHOGA	OH	124	453	23,340,773	6.21	0.37
40	PLAYAS	HILDALGO	NM	1	7	22,836,754	93.60	0.37
41	DEER PARK	HARRIS	TX	10	161	22,481,698	3.10	0.36
42	PHILADELPHIA	PHILADELPHIA	PA	66	289	21,204,356	10.54	0.34
43	KALAMAZOO	KALAMAZOO	MI	19	78	21,066,740	9.09	0.34
44	KENAI	KENAI PENINSULA	AK	3	22	20,939,509	79.09	0.34
45	COVINGTON	ALLEGHANY	VA	2	13	20,761,137	10.56	0.33
46	QUEENSBURY	WARREN	NY	2	23	20,254,625	11.77	0.32
47	NICHOLS	POLK	FL	1	5	19,913,993	7.98	0.32
48	VICTORIA	VICTORIA	TX	4	33	19,630,665	2.71	0.31
49	NEWARK	ESSEX	NJ	60	238	19,487,986	11.97	0.31
50	HOUSTON	HARRIS	TX	128	528	19,472,916	2.69	0.31
	SUBTOTAL			1,304	6,311	2,593,114,914		41.55
	TOTAL FOR ALL OTHERS			18,458	64,820	3,647,915,832		58.45
	GRAND TOTAL			19,762	71,131	6,241,030,746		100.00

million pounds of releases and transfers, accounting for 12 percent of the state total. (Compare Tables 5-4 and 2-11.)

Westwego and Norco led the nation's cities for total TRI amounts.

Two Louisiana cities were ranked first and second nationally for total TRI releases and transfers in 1988: Westwego, with 176.4 million pounds of emissions and Norco with 158.7 million pounds. These two cities were also ranked first and second in 1987.

A single facility was responsible for the TRI totals in 9 of the 50 leading cities.

Top-ranked cities, like top-ranked counties, often owe their large TRI totals to just a few individual facilities. For example, American Cyanamid in Westwego and Shell Oil in Norco were responsible for more than 99 percent of the TRI totals in each city. Other counties and cities show the same pattern. Nine of the top 50 cities have only one TRI facility. (See Tables 5-3 and 5-4.)

Dominant Facilities

American Cyanamid and Shell Oil in Louisiana *each* reported larger TRI releases and transfers than *all* facilities in each of 39 other states.

As suggested above, the dominant role played by a few individual facilities appears in many different analyses. The top two facilities in the country in total TRI releases and transfers were located in Louisiana: American Cyanamid Company in Westwego (with 176.4 million pounds of total releases and transfers) and Shell Oil Company in Norco, Louisiana (158.7 million pounds). The releases and transfers from each of these facilities alone exceeded the total from all facilities in each of 39 other states or jurisdictions. Together, the two facilities reported 45 percent of the state's total releases and transfers, playing a significant role in Louisiana's status as the top state for total TRI releases and transfers. (Yet even if those facilities and their TRI amounts had not existed, Louisiana would have still ranked fourth in the country because of large releases from other facilities in the state.) (See Chapter 3, Table 3-5.)

2 Texas facilities accounted for 30% of the state's total.

Similarly, two Texas facilities dominated that state's TRI totals. The Du Pont facility in Beaumont and the Monsanto Company plant in Alvin were the third- and fifth-ranked facilities among all TRI facilities for total releases and transfers.[4]

Amax Magnesium in Utah reported 80% of the TRI total for the state.

Utah was also dominated by one facility's releases and transfers. Amax Magnesium in Tooele, which reported 109.8 million pounds, was the fourth-ranked facility nationwide for total TRI releases and transfers; the city of Tooele was fifth ranked for total releases and transfers, and the county of Tooele was ranked

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(4) For both these facilities corrections were made to the TRI database after the data for this report was compiled. (See Box 3-C.) For Monsanto, the correction increased their releases by 90 million pounds, changing this Monsanto plant to the top-ranked facility in the nation, with 193.3 million pounds of releases and transfers. The Du Pont plant's releases increased by ten million pounds, placing this facility in third place rather than fourth. These changes also place Texas as first ranked, above Louisiana, for total releases and transfers. Their total releases and transfers were 111.9 and 103.3 million pounds, respectively.

first in total air emissions and ninth for total releases and transfers among counties nationwide. Amax Magnesium accounted for 80 percent of the total TRI releases and transfers for the state of Utah.

Comparison to 1987

Most states and counties had lower TRI totals in 1988 than in 1987.

Total TRI releases and transfers dropped from 7.0 billion pounds in 1987 to 6.2 billion pounds in 1988, and facilities in all but 18 U.S. jurisdictions reported lower releases and transfers in 1988 than in 1987. Texas facilities reported the largest drop in releases and transfers, from 883.5 million pounds in 1987 to 724.5 million pounds in 1988.[5] (See Figure 5-1; compare Tables 5-1 and 2-8.)

Other states reporting large drops included Utah, where releases and transfers fell by almost half (from 252.9 to 137.5 million pounds) and Louisiana (from 844.2 to 741.2 million pounds). Utah was the only state among the top ten in 1987 but not in 1988, going from ninth place to sixteenth in the nation. This decrease is due to a reporting change by a single facility, Kennecott Utah Copper (see Box 7-A in Chapter 7). California facilities reported slight increases, moving it from the 11th-ranked TRI total for 1987 to the 9th-ranked for 1988, and making it the only new state to appear among the top ten. Two other states reported significant increases between 1987 and 1988: Kansas increased from 134.9 to 174.5 million pounds, shifting from 20th to 13th place in the nation, and Indiana increased from 256.8 to 276.3 million pounds, moving from eighth to fourth place.

Both the overall share of releases and transfers contributed by the top 25 counties and the specific counties ranked high were relatively stable between 1987 and 1988. The proportion of releases and transfers accounted for by the top 25 counties decreased two percent, from 39 percent in 1987 to 37 percent in 1988. Jefferson and Saint Charles Parishes in Louisiana retained their first and second place rankings over the two years, and eight of the top ten counties in 1988 were among the top ten in 1987. The two newcomers were Polk County, Florida and Salt Lake County, Utah.

CHEMICAL COMPOSITION OF TRI TOTALS

Major Chemicals

The chemical composition of TRI totals varies from state to state. Of the ten chemicals with the largest TRI totals, toluene is prominent in all ten of the highest-ranked states, and sulfuric acid is high in most. Some chemical releases

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(5) However, corrections to the database made after the date for this report was compiled added 100 million pounds of underground injection releases to the total for Texas, so that the decrease was not as significant. (See Box 3-C.)

appear to follow geographic lines, probably indicating concentrations of similar manufacturing operations. This is particularly true in the Midwestern/Mid-Atlantic "rust belt" that stretches from Illinois to Pennsylvania. Toluene, for example, appears among the top three chemicals for Illinois, Indiana, Michigan, and Pennsylvania, while ranking between sixth and tenth for the other states. Hydrochloric acid ranked among the top ten chemicals in each of seven top states, four of which are in the Midwest: Indiana, Illinois, Michigan, and Ohio. Zinc and manganese compounds each appear on the top ten lists for four states, three of which are in the Midwest or Mid-Atlantic (Illinois, Michigan, and Pennsylvania for zinc and Indiana, Ohio, and Pennsylvania for manganese). (See Figure 5–2.)

Carcinogens

Facilities in California, Michigan, Florida, and Indiana discharged a significant proportion of the carcinogen dichloromethane in their TRI wastes.

Dichloromethane, a carcinogen, was among the top ten chemicals in California, Michigan, Florida, and Indiana. (See Chapter 4 for the definition of carcinogen used in this report.) In addition, the carcinogen asbestos (friable), was ranked tenth among all chemicals in Tennessee. Like the overall TRI totals, carcinogens were often concentrated in a small number of counties in each state. In all four states with large totals of dichloromethane, releases and transfers were concentrated in one to three counties: Los Angeles and Orange Counties accounted for 60 percent of California's total carcinogens; Kalamazoo and Wayne Counties accounted for 46 percent of Michigan's total carcinogens; Posey, Marion, and Lake Counties accounted for 51 percent of total carcinogens in Illinois; and

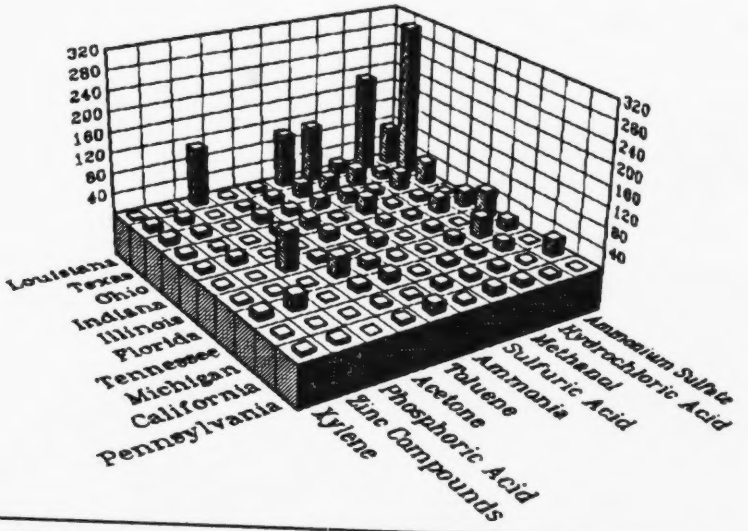


Figure 5–2. The 10 States with the Largest TRI Total Releases and Transfers and Selected Chemicals, 1988. (Chemicals Rleased and Transferred in the Largest Amounts nationwide; shown in millions of pounds.)

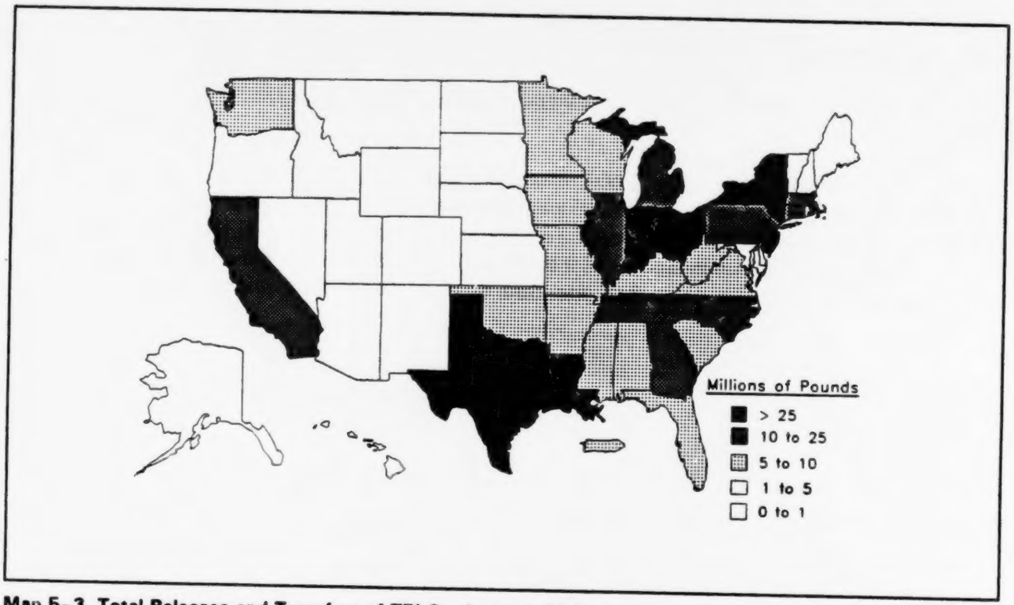
Bradley County accounted for one quarter of Tennessee's total carcinogens. In Bradley County, Tennessee, the one facility transferring asbestos off-site was Allied Automotive-Bendix FMD, which transferred 3.7 million pounds off-site to a facility in the same city owned by its parent company, Allied Signal. (See Maps 5-3 and 5-4.)

Facilities in the 25 counties with the largest total release and transfers of TRI carcinogens generated 30 percent of the national TRI total of carcinogens in 1988. Jefferson County, Louisiana, ranked highest with 13.5 million pounds (43 percent of the Louisiana total). Jefferson also ranked first for totals of all TRI chemicals. Three other counties accounted for more than one third of their state's total

Facilities in 25 counties in 12 states generated almost 1/3 of the TRI carcinogen total for the nation.

Table 5-5. The 25 Counties with the Largest TRI Releases and Transfers of Carcinogens, 1988.

RANK	COUNTY	STATE	RELEASES AND TRANSFERS Pounds	PERCENT OF STATE CARCINOGEN TOTAL	PERCENT OF STATE TOTAL
1	JEFFERSON	LA	13,508,841	42.84	1.82
2	HARRIS	TX	10,886,816	23.68	1.50
3	MONROE	NY	10,458,082	33.65	6.08
4	LOS ANGELES	CA	10,213,343	43.27	5.07
5	JEFFERSON	TX	7,273,800	15.82	1.00
6	KALAMAZOO	MI	6,807,107	30.63	2.94
7	POSEY	IN	6,737,697	23.18	2.44
8	BRAZORIA	TX	5,877,392	12.78	0.81
9	NUECES	TX	5,333,638	11.60	0.74
10	ALBANY	NY	4,883,829	15.72	2.84
11	MARION	IN	4,640,833	15.97	1.68
12	BERKSHIRE	MA	4,634,636	43.22	6.54
13	BROOME	NY	4,557,858	14.67	2.65
14	ALLEN	OH	4,495,022	13.19	1.20
15	OUACHITA	LA	4,273,609	13.55	0.58
16	CUYAHOGA	OH	4,151,708	12.18	1.10
17	ERIE	PA	4,141,068	17.17	2.06
18	ORANGE	CA	3,990,421	16.91	1.98
19	BRADLEY	TN	3,756,661	25.16	1.51
20	ALLEGHENY	PA	3,687,578	15.29	1.83
21	SALT LAKE	UT	3,584,990	84.59	2.61
22	COOK	IL	3,544,248	20.54	1.41
23	LAKE	IN	3,543,096	12.19	1.28
24	WASHINGTON	OH	3,510,348	10.30	0.93
25	WAYNE	MI	3,370,448	15.17	1.45
	SUBTOTAL		141,863,069		
	TOTAL FOR OTHER CARCINOGENS		329,773,691		
	CARCINOGEN TOTAL		471,636,760		
	GRAND TOTAL		6,241,030,746		


Millions of Pounds
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10 to 25
5 to 10
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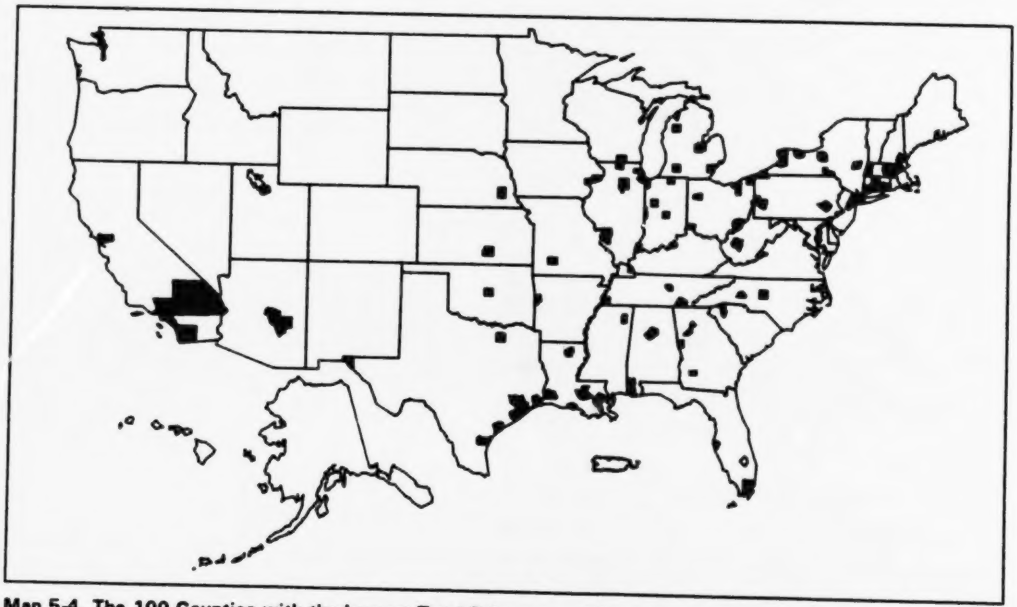
Map 5-3. Total Releases and Transfers of TRI Carcinogens, 1988.



Map 5-4. The 100 Counties with the Largest Total Releases and Transfers of TRI Carcinogens, 1988.

carcinogens in 1988: Salt Lake County, Utah (85 percent); Los Angeles County, California; and Berkshire County, Massachusetts (43 percent each).[6] The top 25 counties were located in only 12 states: Louisiana, Texas, New York, California, Michigan, Indiana, Massachusetts, Ohio, Pennsylvania, Tennessee, Utah, and Illinois. Texas had four counties among the top 25, while both New York and Indiana had three top-ranked counties each. (See Table 5-5.)

ENVIRONMENTAL DISTRIBUTION

The overall geographical patterns described above vary according to the particular form of release to the environment. Air emissions, for example, are the major form of release in many areas, whereas underground injection is a major form in just a few. The following section examines the variations in environmental distribution in 1988 TRI totals nationwide. More detailed comparisons of shifts in the prevalent types of environmental release and transfers from 1987 to 1988 are contained in Chapters 7 through 10, which examine data from facilities that reported to TRI in both years. (See Figure 5-3.)

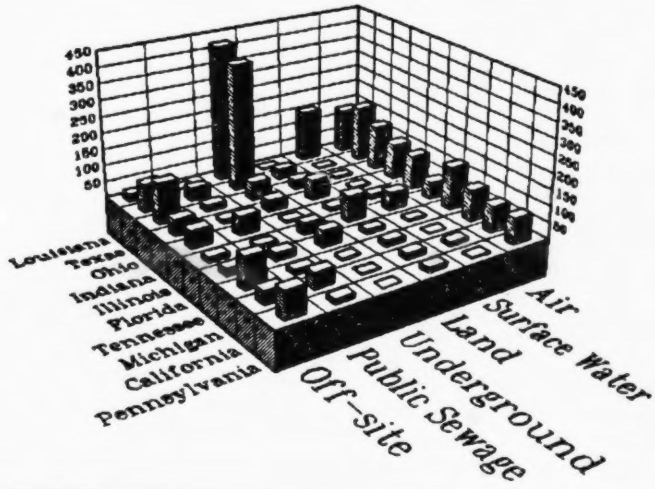


Figure 5-3. Environmental Distribution of the 10 States with the Largest TRI Total Releases and Transfers. (Releases and Transfers Shown in Millions of Pounds.)

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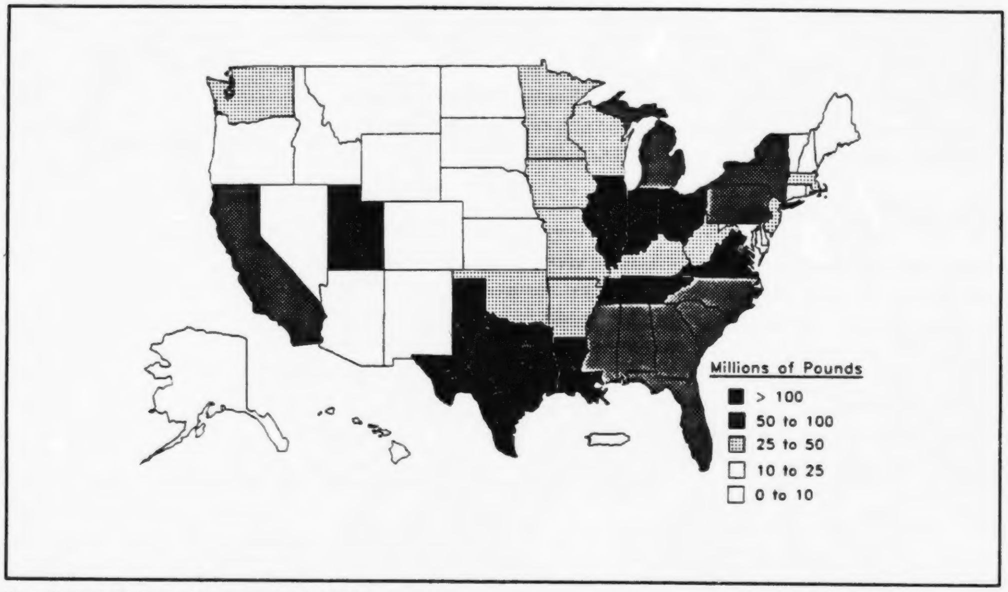
[6] A data correction made after data analyses for this report were completed reduced the carcinogen total for Berkshire County (Massachusetts) by 4.4 million pounds, decreasing the county's share of the state total.



Map 5-5. TRI Total Air Emissions, 1988.

Air Emissions

Texas facilities reported the largest total air emissions in the nation for 1988.

Texas facilities reported the largest amounts of TRI air emissions for 1988: 169.9 million pounds, seven percent of the national total. Three Texas counties (Harris, Brazoria, and Jefferson) accounted for 43 percent of the state's total. Almost half of Brazoria's total air emissions were from a single Dow Chemical Company facility in Freeport (7.7 million pounds). (See Map 5-5 and Table 5-6.)

Texas led the nation for **fugitive air emissions** (unintentional emissions that do not have a clearly identifiable point of origin, such as equipment leaks and general evaporation during industrial processes), with 74.4 million pounds or ten percent of the national total. It did not, however, lead the nation for **point source air emissions** (emissions intentionally released from a smokestack, vent, or other discrete sources). Utah ranked first in this category, with 116.6 million pounds, or seven percent of the national total, of point source air emissions: 92 percent of Utah's total air emissions came from Tooele County, and all of Tooele County's emissions came from one facility operated by Amax Magnesium in Tooele, Utah. This plant was the top-ranked facility for air emissions in the nation, generating more than four percent (109.7 million pounds) of total TRI air emissions in the U.S. (See Table 3-6 and Table D-3, Appendix D.)

The distribution of point and fugitive emissions varied by state. Alaska and Utah are the only two states in which facilities reported over 90 percent of total air emissions under the point source category. In addition, Alaska and Utah were two of only six jurisdictions in which total air emissions in general make up over eighty percent of total releases and transfers, or more than twice the national average of 39 percent. Thus in Alaska and Utah, TRI releases and transfers are concentrated to an extraordinary extent in point source air emissions.

Nationwide, air emissions decreased from 1987 to 1988, going from 2.7 billion pounds to 2.4 billion pounds. Texas facilities reported a considerable drop in air emissions, from 242.6 million pounds to 169.9 million pounds. In contrast, Utah facilities reported a 34.9 million pound increase in air emissions. Other than Texas and Utah, emission levels in the top-ranked states remained relatively constant.[7] (Compare Tables 5-6 and 2-8.)

Air emissions in Texas decreased from 1987 to 1988, while air emissions in Utah increased.

Discharges to Surface Water

Louisiana facilities discharged 157.3 million pounds to surface water in 1988—43 percent of the national total, almost three times more than the second ranked state for surface water discharges (Florida). Discharges in Louisiana were dominated by individual counties and facilities. Facilities in Saint James Parish contributed 71 percent of Louisiana's and 31 percent of the nation's discharges to surface water. Saint James's total was due to two facilities both belonging to the same company, Freeport McMoran's Agrico Division, with plants in Uncle Sam, Louisiana (62.7 million pounds) and Donaldsonville, Louisiana (47.3 million pounds). Thus, this one company contributed over 30 percent of the nation's total TRI discharges to surface water. (See Map 5-6 and Table 5-6.)

Discharges of TRI chemicals to surface water were 3 times greater in Louisiana than those in any other state, and were largely due to a single company.

Louisiana is one of only four states discharging more than a fifth of their TRI releases and transfers to surface water. Nationally, surface water discharges make up only six percent of total releases and transfers. Thus, both its overall high levels of releases and transfers and its unusual reliance on discharges to surface water contribute to Louisiana's striking dominance in this category.

Overall, surface water discharges dropped from 403.1 million pounds to 361.6 million pounds from 1987 to 1988. Maryland and Tennessee, which were top-ranked for surface water discharges, cut their 1987 discharges, by more than half in 1988, dropping out of the top ten. Facilities in Washington state, on the other hand, more than doubled their surface water discharges in 1988, placing it among the top ten for the first time. Arkansas also joined the top ten in 1988.

(7) Alabama reported a reduction of 44.0 million pounds. However, this is changed to 1.0 million pounds when accounting for a correction that was made to the TRI database after the data was compiled for this report. (See Box 3-C.)

Table 5–6. TRI Facilities, Forms, and Environmental Distribution of Releases and Transfers by State, 1988.

TRI TOTAL RANK	STATE	FACILITIES Number	FORMS Number	AIR Pounds	SURFACE WATER Pounds	LAND Pounds	UNDERGROUND Pounds
22	Alabama	382	1,549	54,224,680	6,908,442	4,597,573	1,634,717
38	Alaska	6	45	21,996,215	4,274,455	1,467	1,018
53	American Samoa	2	3	29,500	0	0	0
24	Arizona	166	534	14,780,075	9,850	53,764,405	0
25	Arkansas	304	988	46,801,874	7,446,055	1,938,400	7,036,201
9	California	1,655	5,350	81,594,258	11,017,789	18,163,490	946,853
42	Colorado	170	496	11,129,196	87,843	2,621,705	0
30	Connecticut	403	1,358	23,950,336	7,305,148	1,676,468	0
46	Delaware	56	223	4,873,438	574,167	251,208	0
54	District of Columbia	1	1	250	250	0	0
6	Florida	467	1,307	53,107,471	55,798,454	82,552,586	34,651,596
18	Georgia	598	1,984	82,538,859	6,509,879	9,178,212	52,800
49	Hawaii	24	86	874,145	10,000	179,745	1,051,509
44	Idaho	48	146	3,982,578	296,220	10,173,306	1,400
5	Illinois	1,229	4,375	104,592,707	14,304,086	10,469,190	7,340,184
4	Indiana	756	2,853	110,075,627	4,873,432	63,043,385	34,820,650
28	Iowa	331	1,025	43,135,115	1,563,824	240,030	0
13	Kansas	186	712	24,631,652	801,192	482,324	90,766,710
19	Kentucky	298	1,303	43,739,655	1,697,760	5,736,357	30,000,250
1	Louisiana	286	1,833	133,070,512	157,333,611	2,019,803	423,320,002
41	Maine	98	351	16,553,882	439,516	955,633	0
36	Maryland	195	713	17,383,926	3,756,283	2,666,276	2
26	Massachusetts	587	1,746	26,494,040	699,295	906,657	4,000
8	Michigan	790	3,249	95,641,067	1,147,387	17,593,984	5,617,060
27	Minnesota	330	1,081	49,388,024	2,758,505	889,448	0
20	Mississippi	248	843	53,968,917	1,984,907	9,000,495	46,806,563
12	Missouri	495	1,810	48,634,108	4,091,507	40,182,059	500
34	Montana	24	121	2,384,167	124,874	32,910,607	0
40	Nebraska	134	387	17,499,077	309,468	55,018	68,208
47	Nevada	34	93	724,620	250	3,490,521	0
43	New Hampshire	137	366	11,654,930	484,711	428,868	0
15	New Jersey	824	2,845	36,522,739	1,003,447	2,874,575	2,750
39	New Mexico	34	129	1,883,293	750	22,267,882	0
14	New York	816	2,700	92,806,469	2,084,783	1,141,102	251
17	North Carolina	805	2,689	88,335,109	695,661	19,607,668	250
52	North Dakota	28	67	1,236,260	3,600	752	0
3	Ohio	1,360	5,054	136,453,929	5,897,407	30,202,247	56,920,293
31	Oklahoma	182	668	31,100,849	363,208	1,787,909	6,353,464
35	Oregon	194	662	19,887,098	303,696	1,032,032	1
10	Pennsylvania	1,030	3,862	80,987,641	4,453,168	16,424,639	750
37	Puerto Rico	171	530	15,562,284	123,099	109,825	0
45	Rhode Island	188	517	5,774,024	385,645	157,968	0
23	South Carolina	375	1,488	62,613,127	1,599,365	1,306,263	0
48	South Dakota	41	71	2,478,960	2,400	1	0
7	Tennessee	517	1,736	133,697,458	6,398,920	13,210,057	49,906,110
2	Texas	1,089	5,264	169,936,759	4,306,731	30,837,047	390,826,922
16	Utah	111	416	119,410,265	255,653	15,360,002	0
50	Vermont	55	151	1,519,293	113,058	24,341	0
51	Virgin Islands	1	18	1,490,792	2,500	140,342	0
11	Virginia	405	1,425	119,593,757	19,780,454	5,059,278	1,373
32	Washington	305	950	27,604,148	13,511,390	914,424	0
29	West Virginia	101	606	31,885,186	3,122,244	710,117	97,712
21	Wisconsin	664	2,237	44,412,636	535,849	6,944,824	250
33	Wyoming	26	115	2,923,126	42,050	15,274,367	27,113,559
	TOTAL	19,762	71,131	2,427,570,103	361,594,238	561,556,882	1,215,343,908

Table 5-6 Continued.

STATE	PUBLIC SEWAGE	OFF-SITE	TOTAL RELEASES AND TRANSFERS	
	Pounds	Pounds	Pounds	Percent
Alabama	1,223,368	15,474,062	84,062,842	1.35
Alaska	1,000	202,310	26,476,465	0.42
American Samoa	0	0	29,500	0.00
Arizona	4,524,493	1,578,483	74,657,306	1.20
Arkansas	1,108,236	7,941,692	72,272,458	1.16
California	48,609,149	41,237,250	201,568,789	3.23
Colorado	1,879,125	5,415,112	21,132,981	0.34
Connecticut	2,795,903	17,722,091	53,449,946	0.86
Delaware	2,271,089	2,722,103	10,692,005	0.17
District of Columbia	250	250	1,000	0.00
Florida	8,756,017	14,789,622	249,655,746	4.00
Georgia	8,658,999	24,472,111	131,410,860	2.11
Hawaii	835,250	13,682	2,964,331	0.05
Idaho	515,514	136,595	15,105,613	0.24
Illinois	59,151,864	55,444,122	251,302,153	4.03
Indiana	12,067,445	51,466,382	276,346,921	4.43
Iowa	6,262,070	7,467,635	58,668,674	0.94
Kansas	3,387,911	54,398,454	174,468,243	2.80
Kentucky	2,358,242	47,787,378	131,319,642	2.10
Louisiana	3,565,551	21,897,335	741,206,814	11.88
Maine	2,733,459	1,282,633	21,965,123	0.35
Maryland	3,959,217	5,574,470	33,340,174	0.53
Massachusetts	16,649,263	26,068,310	70,821,565	1.13
Michigan	15,833,193	95,848,610	231,681,301	3.71
Minnesota	6,557,312	5,913,230	65,506,519	1.05
Mississippi	1,366,669	7,693,365	120,820,916	1.94
Missouri	77,606,284	14,113,097	184,627,555	2.96
Montana	1,312	46,370	35,467,330	0.57
Nebraska	875,885	3,841,681	22,649,337	0.36
Nevada	19,505	639,396	4,874,292	0.08
New Hampshire	504,434	2,098,561	15,171,504	0.24
New Jersey	53,823,264	68,514,999	162,741,774	2.61
New Mexico	36,116	210,780	24,398,821	0.39
New York	25,643,490	50,430,010	172,106,105	2.76
North Carolina	7,493,240	20,725,143	136,857,071	2.19
North Dakota	52,681	101,287	1,394,580	0.02
Ohio	22,193,113	124,322,305	375,989,294	6.02
Oklahoma	424,512	11,690,367	51,720,309	0.83
Oregon	7,067,786	5,313,630	33,604,243	0.54
Pennsylvania	15,437,749	83,798,182	201,102,129	3.22
Puerto Rico	8,032,040	5,015,687	28,842,935	0.46
Rhode Island	1,930,025	4,321,293	12,568,955	0.20
South Carolina	2,688,403	13,970,376	82,177,534	1.32
South Dakota	156,884	421,384	3,059,629	0.05
Tennessee	24,623,468	21,581,214	249,417,227	4.00
Texas	40,459,590	88,110,657	724,477,706	11.61
Utah	900,304	1,546,165	137,472,389	2.20
Vermont	72,765	645,139	2,374,596	0.04
Virgin Islands	0	0	1,633,634	0.03
Virginia	38,704,548	13,480,493	196,619,903	3.15
Washington	977,544	7,330,715	50,338,221	0.81
West Virginia	3,338,844	18,747,276	57,901,379	0.93
Wisconsin	22,406,583	30,749,287	105,049,429	1.68
Wyoming	10,350	101,526	45,464,978	0.73
TOTAL	570,551,308	1,104,414,307	6,241,030,746	100.00

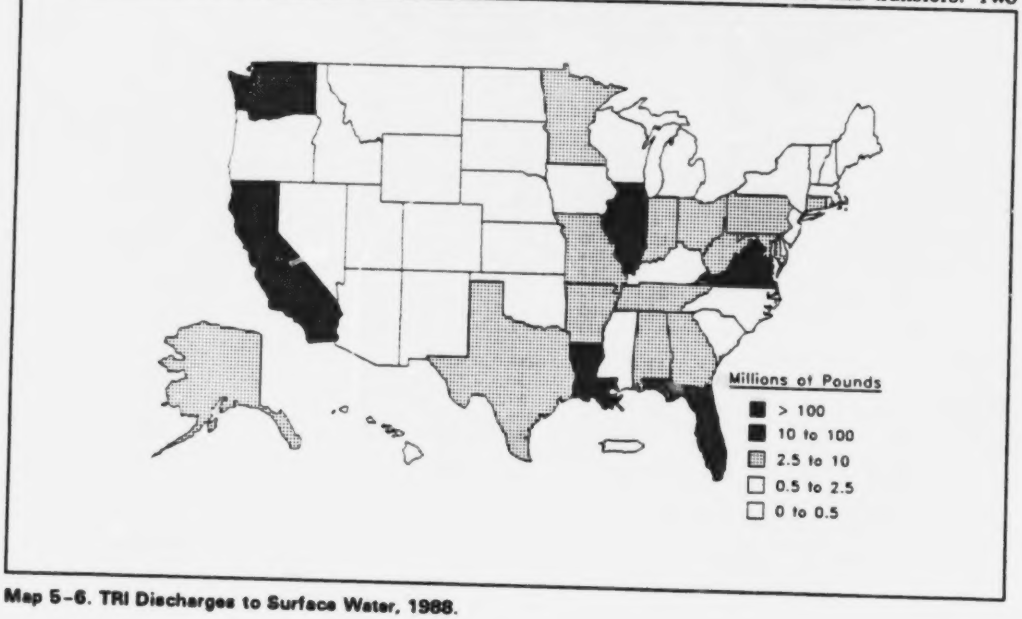
California reduced discharges by more than half, but still remained among the top ten. Over ten million pounds of the reduction was due to the elimination of surface water discharges of arsenic compounds at one facility, the Kerr-McGee plant in Trona, California. (Compare Tables 5-6 and 2-8.)

On-Site Land Disposal

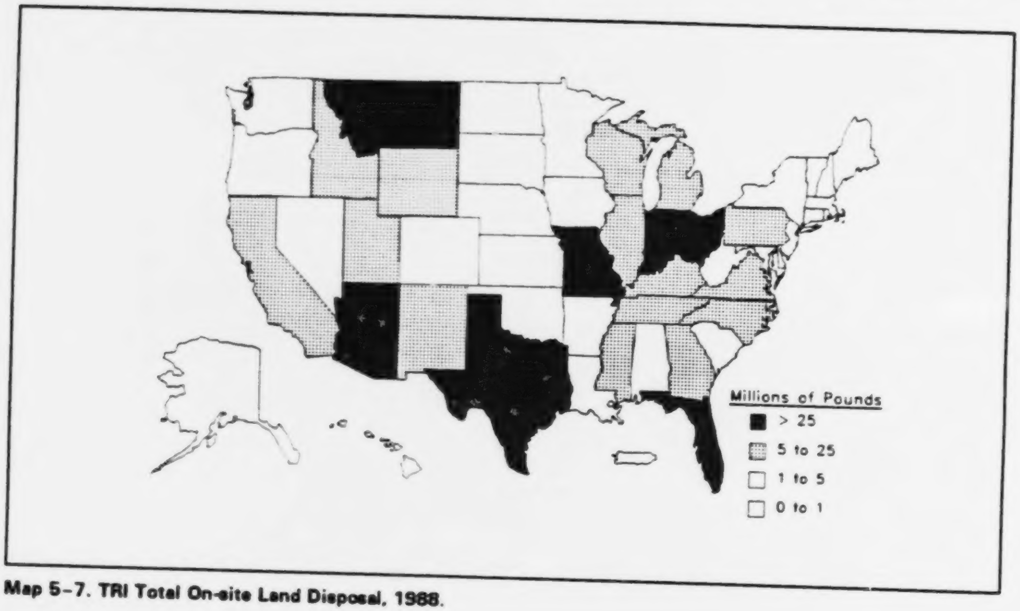
Florida facilities generated 15% of the total on-site land disposal nationwide.

Florida facilities led the nation in the total quantity of on-site land disposal, with 82.6 million pounds, or 15 percent of the national total. A single facility in Hamilton County—Occidental Chemical Corporation (White Springs, Florida)—generated 59 percent (48.7 million pounds) of the state's total on-site land releases. Indiana ranked second in this category, with 63.0 million pounds of on-site land releases. Facilities in Lake County, Indiana, disposed of 90 percent of Indiana's total and Inland Steel Company in East Chicago, Indiana, (50.0 million pounds) accounted for almost all of Lake County's total. (See Map 5-7 and Table D-4, Appendix D.)

Arizona was one of four states—including Nevada, Montana, and New Mexico, all of which are in relatively arid, western locations—in which more than 70 percent of the state TRI total was disposed of on land. This high proportion of on-site land releases contrasts sharply with the national average of only nine percent. Because Arizona facilities disposed of 72 percent of their TRI chemicals on land, they raised the state to prominence in this category despite the fact that Arizona only ranks 24th in the nation for overall releases and transfers. Two



Map 5-6. TRI Discharges to Surface Water, 1988.



Map 5-7. TRI Total On-site Land Disposal, 1988.

facilities in Gila County: Asarco, Inc. in Hayden, Arizona, and Cyprus Miami Mining Corporation in Claypool, Arizona, dominated land disposal in the state; the two disposed of 33.7 and 16.9 million pounds respectively, accounting for 94 percent of the land disposal in the state.

Facilities reduced their on-site land disposal by 23% from 1987 to 1988.

Overall, on-site land releases dropped between 1987 and 1988, from 730.9 to 561.6 million pounds, or 23 percent. Facilities in Utah and Florida reported decreases of 148.9 and 98.3 million pounds, respectively, while facilities in Indiana registered the largest increase: 39.2 million pounds. The decrease reported in Utah represents a 91 percent drop for on-site land disposal, due almost entirely to the Kennecott Utah Copper facility mentioned earlier. Florida's decrease was 54 percent for the state. (See Figure 5-4 and compare Tables 5-6 and 2-8.)

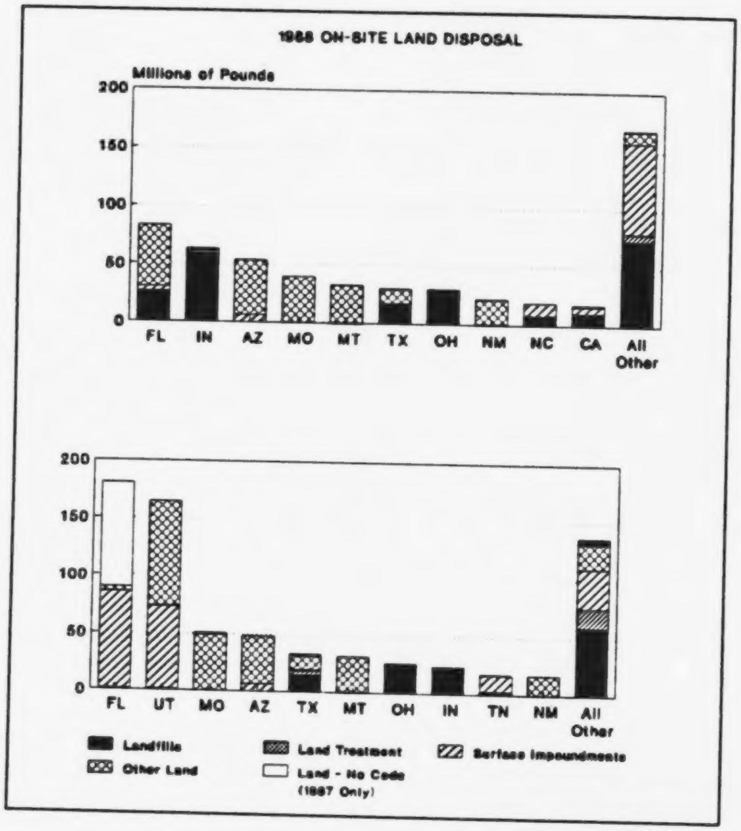


Figure 5-4. The 10 States with the Largest TRI Land Disposal, 1987 and 1988.

Underground Injection

Facilities in 32 jurisdictions reported injecting TRI chemical wastes into underground wells, making underground injection less geographically diverse than any other form of release. (Many states do not have appropriate geological conditions to support this method of chemical waste disposal.[9]) Louisiana facilities led the nation in the underground injection of wastes, releasing 423.3 million pounds or more than one third of the national total. Louisiana's underground injection releases were dominated by two facilities: American Cyanamid Company in Westwego (175.2 million pounds) and Shell Oil Company in Norco (156.4 million pounds). Texas ranked second in underground injection releases with 390.8 million pounds. A Du Pont plant in Beaumont, Texas, injected 108.1 million pounds of TRI chemicals underground, and a Monsanto facility in Alvin, Texas injected 102.8 million pounds.[10] Together, Texas and Louisiana accounted for 67 percent of all underground injection in the U.S. (See Map 5-8 and Table 5-6.)

Louisiana and Texas reported 67% of the nation's underground injection of TRI wastes.

Nationwide, underground injection amounts dropped by six percent between 1987 and 1988 from 1.3 billion to 1.2 billion pounds. Although the same ten states ranked highest for underground injection in both 1987 and 1988, Louisiana and Tennessee reported significant drops (13 and 28 percent, respectively), while Kansas reported a 38 percent increase. (Compare Tables 5-6 and 2-8.)

Transfers to Public Sewage Treatment Plants

Missouri led the nation in the quantity of TRI transfers to public sewage plants in 1988, with 77.6 million pounds or 14 percent of the national total. Facilities in Illinois, New Jersey, California, Texas, and Virginia each discharged seven percent or more of the total transfer to public sewage nationwide. (See Map 5-9 and Table 5-6.)

Missouri discharged the most TRI wastes to public sewage treatment plants.

Missouri's dominance in this category is partially explained by the fact that 42 percent of all TRI toxics in the state were discharged to public sewage systems. Almost 74 percent of Missouri's public sewage discharges occurred in Saint Louis county; over 90 percent of Saint Louis county's discharges came from Columbian Chemicals Company in St. Louis, Missouri, which accounted for nine percent of the *national* total discharge to public sewage and discharged more than twice as much (52.4 million pounds) to public sewage as any other facility in the nation. (Chapter 8 provides further analysis of public sewage transfers in Missouri.) Facilities in four other jurisdictions (District of Columbia, Hawaii, New Jersey, and Puerto Rico) also discharged a quarter or more of their TRI totals to public sewage.

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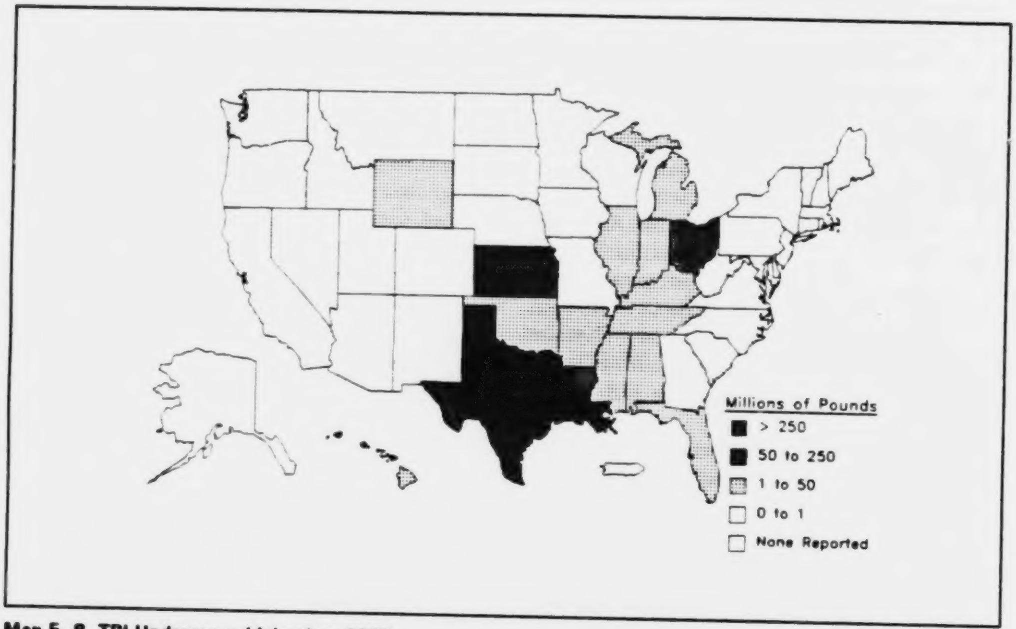
(9) Underground injection requires special geological conditions, including a porous layer approximately one mile deep, through which wastes can disperse, topped by a layer of clay that seals and separates the porous layer from the near-to-surface groundwater.



Map 5-8. TRI Underground Injection, 1988.

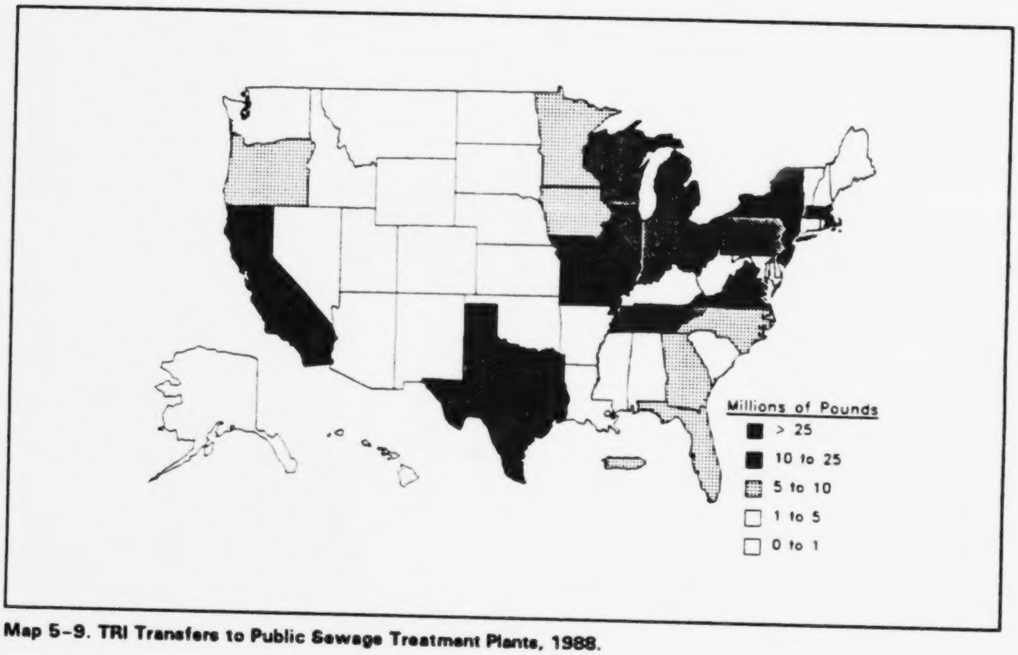
Transfers to public sewage treatment plants dropped from 614.8 to 570.6 million pounds.

Total public sewage transfers dropped from 614.8 million pounds in 1987 to 570.6 million pounds in 1988. Transfers among the top ten states for public sewage remained relatively constant with the exception of Wisconsin, where facilities reported an increase from 14.8 million pounds to 22.4 million pounds (which shifted Wisconsin into the top ten public sewage discharge states in 1988). Discharges in four other states (Texas, Virginia, Illinois, and Tennessee) that ranked among the top ten in both years decreased significantly, however. (Compare Tables 5-6 and 2-8.)

Off-Site Transfers

The largest share of TRI off-site transfers originated in Ohio.

Ohio ranked first in the nation for the quantity of transfers to off-site locations (other than public sewage systems), with 124.3 million pounds or 11 percent of the national total. Four Ohio counties accounted for just over half (51 percent) of Ohio's off-site transfer total: Ashtabula, Cuyahoga, Stark, and Richland. Michigan, Texas, Pennsylvania, and New Jersey all transferred more than 100 million pounds of TRI chemicals off-site in 1988. Three of these top five states, Michigan, New Jersey, and Pennsylvania, were the only states in the nation to transfer more than 40 percent of their total TRI releases and transfers off-site.



Map 5-9. TRI Transfers to Public Sewage Treatment Plants, 1988.

Overall levels of off-site transfers dropped from 1.4 to 1.1 billion pounds between 1987 and 1988. Facilities in eight of the top ten states reported decreases in off-site transfers between 1987 and 1988, but Texas facilities reported the largest drop, from 157.6 million pounds in 1987 to 88.1 million pounds in 1988. Off-site transfers are discussed in more detail below.

Differential State and County Rankings by Type of Release

The differing patterns of environmental distribution are further shown in comparing the rankings of states and counties for the different forms of releases and transfers. Many top-ranked states for TRI totals ranked high for several forms of releases and transfers, but rarely did they have top-ranked amounts across the board. For example, Louisiana led the nation for total releases and transfers, as well as for discharges to surface water and underground injection, but ranked 24th for transfers to public sewage. In contrast, Arizona ranked 24th for TRI totals, but third for total land disposal. (See Table 5-7.)

States with top-ranked TRI totals did not necessarily rank high for all forms of releases and transfers.

Table 5-7. State Rankings for Types of Releases and Transfers, TRI 1988.

STATE	AIR Rank	SURFACE WATER Rank	LAND Rank	UNDERGROUND Rank	PUBLIC SEWAGE Rank	OFF-SITE Rank	TRI TOTAL Rank	CARCINOGENS Rank
Alabama	16	9	23	15	35	20	22	16
Alaska	32	16	50	25	51	46	38	44
American Samoa	53	54	54	54	54	54	53	53
Arizona	38	47	3	45	22	39	24	34
Arkansas	21	7	29	12	36	26	25	29
California	13	6	10	17	4	11	9	7
Colorado	40	44	27	41	33	32	42	32
Connecticut	31	8	31	44	27	19	30	13
Delaware	42	31	42	42	31	37	46	40
District of Columbia	54	53	53	34	52	52	54	54
Florida	18	2	1	8	15	21	6	21
Georgia	12	10	18	20	16	14	18	12
Hawaii	51	46	44	16	40	51	49	48
Idaho	43	39	17	23	41	47	44	41
Illinois	8	4	16	11	2	6	5	9
Indiana	7	13	2	7	14	8	4	5
Iowa	24	25	43	40	21	28	28	26
Kansas	30	28	40	3	25	7	13	39
Kentucky	23	23	21	9	30	10	19	18
Louisiana	4	1	28	1	24	15	1	3
Maine	36	34	35	52	28	41	41	37
Maryland	35	18	26	31	23	31	36	36
Massachusetts	29	29	37	21	11	13	26	14
Michigan	9	26	11	14	12	2	8	8
Minnesota	19	20	38	50	20	30	27	30
Mississippi	17	22	19	6	34	27	20	25
Missouri	20	17	4	27	1	22	12	22
Montana	46	41	5	46	50	50	34	45
Nebraska	34	37	48	19	39	36	40	38
Nevada	52	52	24	49	48	43	47	52
New Hampshire	39	33	41	48	42	38	43	35
New Jersey	25	27	25	22	3	5	15	15
New Mexico	47	51	8	47	47	45	39	51
New York	10	21	33	28	7	9	14	4
North Carolina	11	30	9	30	18	17	17	11
North Dakota	50	48	51	33	46	49	52	46
Ohio	2	12	7	4	10	1	3	2
Oklahoma	27	36	30	13	43	25	31	27
Oregon	33	38	34	32	19	33	35	33
Pennsylvania	14	14	12	26	13	4	10	6
Puerto Rico	37	42	47	39	17	34	37	19
Rhode Island	41	35	45	37	32	35	45	42
South Carolina	15	24	32	51	29	23	23	24
South Dakota	45	50	52	35	44	44	48	49
Tennessee	3	11	15	5	8	16	7	10
Texas	1	15	6	2	5	3	2	1
Utah	6	40	13	43	38	40	16	31
Vermont	48	43	49	38	45	42	50	47
Virgin Islands	49	49	46	36	53	53	51	43
Virginia	5	3	22	24	6	24	11	23
Washington	28	5	36	53	37	29	32	28
West Virginia	26	19	39	18	26	18	29	17
Wisconsin	22	32	20	29	9	12	21	20
Wyoming	44	45	14	10	49	48	33	50

Table 5-8. County Rankings* for TRI Facilities and Types of Releases and Transfers, 1988.

COUNTY	STATE	NO. OF FACILITI Rank	AIR Rank	SURFACE WATER Rank	LAND Rank	UNDER-GROUND Rank	PUBLIC SEWAG Rank	OFF-SITE Rank	TRI TOTAL Rank
JEFFERSON	LA	-	-	-	-	1	-	-	1
ST CHARLES	LA	-	-	-	-	2	-	-	2
SEDGWICK	KS	-	-	-	-	5	-	2	3
JEFFERSON	TX	-	14	-	-	3	-	9	4
ST JAMES	LA	-	17	1	-	17	-	-	5
ASCENSION	LA	-	2	3	-	8	-	-	6
HARRIS	TX	3	4	-	-	16	5	3	7
BRAZORIA	TX	-	13	-	-	4	-	-	8
TOOELE	UT	-	1	-	-	-	-	-	9
LAKE	IN	-	-	16	1	23	-	13	10
LOS ANGELES	CA	1	5	-	-	-	4	7	11
CALHOUN	TX	-	-	-	-	6	-	-	12
WAYNE	MI	8	21	-	-	-	21	1	13
ST LOUIS	MO	-	-	-	-	-	-	-	14
COOK	IL	2	6	-	-	-	8	8	15
ALLEN	OH	-	-	-	-	7	-	-	16
HOPEWELL CITY	VA	-	-	4	-	-	3	-	17
HUMPHREYS	TN	-	-	17	25	10	-	-	18
GALVESTON	TX	-	-	-	-	9	-	-	19
NASSAU	FL	-	-	2	-	-	-	-	20
GILA	AZ	-	-	-	2	-	-	-	21
HAMILTON	FL	-	22	-	3	-	-	-	22
ST CLAIR	IL	-	-	-	-	-	-	-	23
HARRISON	MS	-	-	-	-	11	-	-	24
UNION	NJ	-	-	-	-	-	13	4	25

*Rankings for each category shown if among the top 25.

Top county rankings for TRI totals were primarily due to large underground injection releases.

Although air emissions comprise the largest share of the national TRI total (39 percent) and would be expected to dominate the releases and transfers in the top counties, this is not the case. The four counties with the largest TRI totals are top-ranked because of large amounts of underground injection, rather than large air emissions. Even though the underground injection total nationwide is half that of air (representing 20 percent of the TRI totals), underground injection releases are less evenly distributed and therefore concentrated in a few counties, which then appear on the list of top 25 for all releases and transfers. Fewer counties with top-ranked amounts of the other release and transfer types, particularly discharges to surface water and transfers to public sewage, appear on this list because their overall share of the TRI totals is smaller. (See Table 5-8.)

THE INTERSTATE COMMERCE IN TRI CHEMICAL WASTES

Off-site transfers are often shipped across state borders to receiving facilities for treatment, storage, and/or disposal. Seven states (Illinois, Indiana, Michigan, New Jersey, Ohio, Pennsylvania, and Tennessee) rank among the top ten both for their total *shipments of waste out of state* (that is, TRI chemicals generated by in-state facilities and sent out of state) and for their total *receipts of TRI waste* (or, TRI chemical amounts generated by out-of-state facilities that are shipped to receiving locations in the state for treatment, storage, and disposal). Thus, to a large extent, states in which facilities sent a significant amount of waste across the state border also received a significant amount of waste from elsewhere.

Most states both send wastes to and receive wastes from other states.

Most states both ship wastes out of state and have waste management facilities that receive wastes from TRI facilities in other states. Facilities send their TRI chemical wastes out of state for a variety of reasons. Waste management facilities within the state may not handle the particular wastes needing off-site treatment or disposal. Facilities may prefer to send their wastes to another facility owned by the same parent company so that they can closely control how the waste is handled. The distance (and cost of transporting the wastes) may be less to a nearby facility that happens to be across state lines. (See Table D-5 in Appendix D for a full tabulation of the amount of off-site transfers and where they were sent.)

New York, Ohio, and Pennsylvania conduct an active interstate commerce in TRI wastes.

TRI facilities in New York and Ohio send the majority of their TRI off-site transfers to waste management facilities within their own state. Those in Pennsylvania, on the other hand, send a majority out of state with 27 percent of off-site transfers going to Ohio waste management facilities and another 28 percent transported beyond Ohio or New York. However, the majority of the TRI chemical wastes in all three states are received from facilities located within their own state boundaries. New York receives 36.0 million pounds of off-site transfers from in-state facilities out of a total of 51.7 million pounds, or 70 percent. Ohio and Pennsylvania receive 57 percent (87.8 out of 154.6 million pounds) and 52 percent (35.9 out of 69.4 million pounds), respectively. (See Figure 5-5 and Table 5-9.)

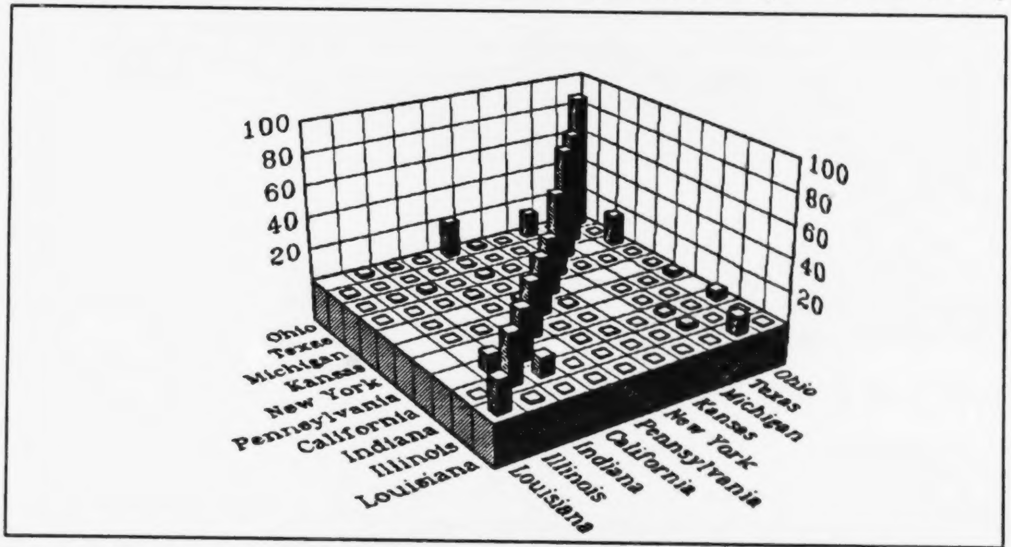


Figure 5-5. The 10 States with the Largest Intrastate Waste Shipments, 1988. (The states on the left are the recipients of the wastes and those on the right the exporters.)

The net distribution of off-site transfers varied considerably. Some states were net recipients of TRI wastes—that is, the total amount received by the state's off-site treatment, storage, and disposal facilities (both from in-state and out-of-state manufacturing facilities) exceeded the amount shipped out of state—while others were net shippers out of state. New Jersey, which was the largest net shipper of waste to other states, sent 27.1 million more pounds of TRI chemicals out of the state than it received from other states. (See Figure 5–6 and Table 5–9.)

New Jersey was the largest net shipper out of state of TRI off-site transfers.

Ohio was the largest net recipient of off-site transfers. Facilities located both in Ohio and in other states sent 154.6 million pounds of wastes to locations in Ohio for treatment or disposal, while facilities in Ohio sent 124.3 million pounds to locations outside of Ohio. On balance, then, Ohio received 30.3 million pounds more than its facilities sent out of state, the largest amount of any state. Five other states (Louisiana, Alabama, South Carolina, Tennessee, and Indiana) all were net recipients of more than ten million pounds of TRI wastes in 1988. Six of the top ten net recipients in 1988 (Ohio, Louisiana, Tennessee, Indiana, Illinois, and Michigan) were also among the top ten states in the nation for total releases and transfers, indicating that the already high TRI totals in these states were increased by shipments of TRI wastes from other states. (See Figure 5–7 and Table 5–9.)

Ohio was the largest net recipient of off-site transfers.

No receiving state was reported for 40.1 million pounds (three percent) of off-site transfers, which somewhat skews the statistics on waste receipts as well as on net amounts. Some of these wastes were sent to locations out of the country, but 65 percent originated at one facility, an Allied Signal plant in Elizabeth, New Jersey, that reported sending 26.3 million pounds of hydrochloric acid off-site to the Atlantic Ocean.

Cities and Facilities Receiving the Largest Amounts of TRI Wastes

Ten cities received 17 percent of the 1988 off-site transfers. Two are located in Wayne County, Michigan (Belleville and Detroit), and three others (Ashtabula, Cleveland, and Grafton) are in Ohio. Seven of the top receiving cities are in states that ranked high for TRI totals of all types. The exceptions are Wichita (Kansas)—the first-ranked city for receipts of off-site transfers—Emelle (Alabama) and Queensbury (New York). (See Table 5–10.)

10 cities—2 in Wayne County, Michigan—received 17% of the 1988 off-site transfers.

Five facilities, including two in Wayne County, Michigan, received 136.8 million pounds (12 percent) of all off-site transfers of TRI wastes in 1988. Vulcan Materials Co. (Wichita, Kansas) received 51.1 million pounds, more than twice as much as second-ranked Michigan Disposal (Belleville, Michigan). Three of the five facilities received larger amounts of hydrochloric acid than of any other TRI chemical; hydrochloric acid accounted for 99 percent of the wastes received by Vulcan Materials (Wichita, Kansas), 70 percent at Reserve Environmental Services (Ashtabula, Ohio), and 64 percent at Dynecol, Inc. (Detroit, Michigan).

Just 5 facilities received 12% of all off-site transfers.

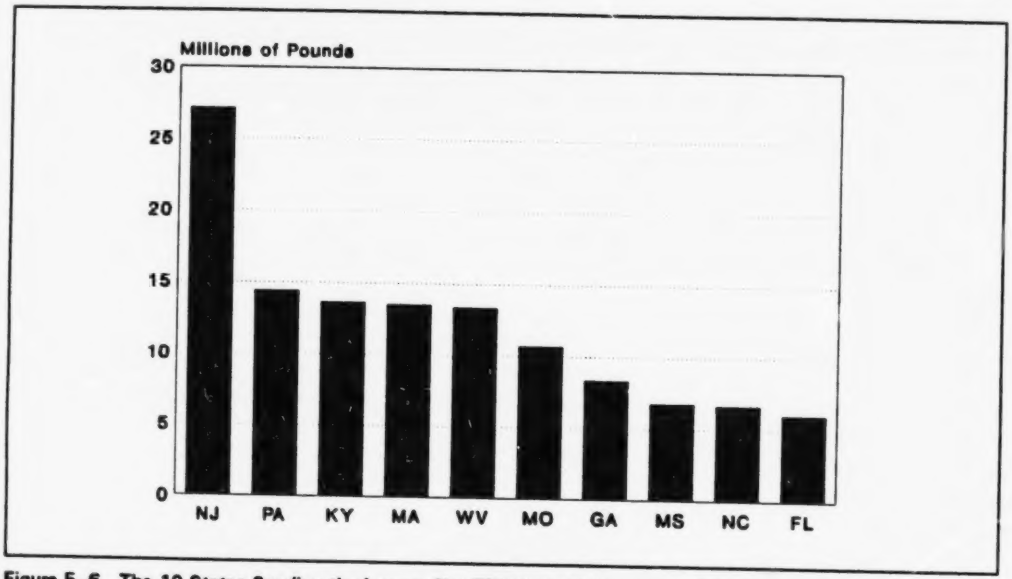


Figure 5-6. The 10 States Sending the Largest Net TRI Waste Shipments to Other States, 1988. (Total amount shipped out of state minus total amount received from both in-state transfers and from other states.)

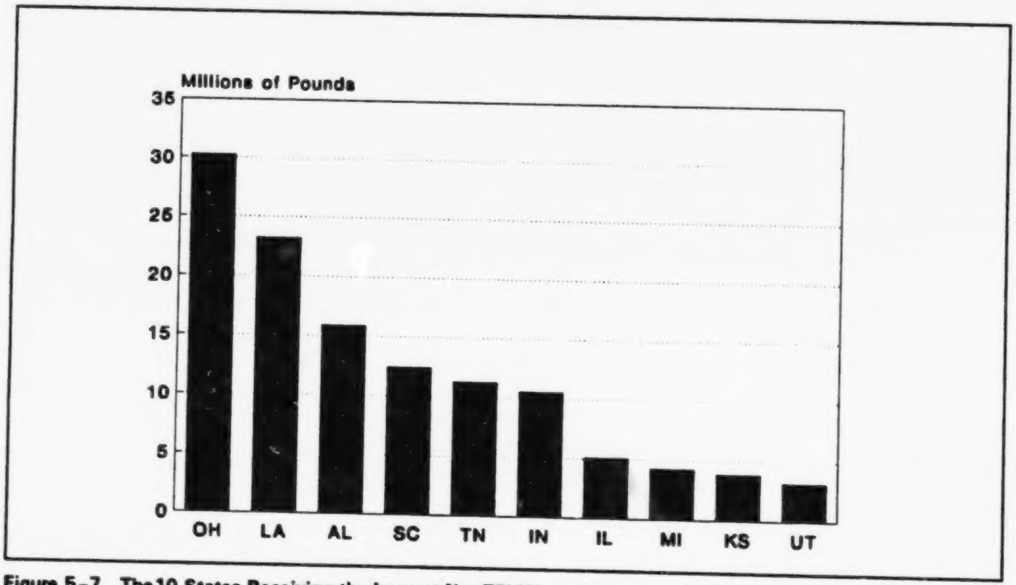


Figure 5-7. The 10 States Receiving the Largest Net TRI Waste Shipments from Other States, 1988. (Total amount received in state from both in-state transfers and from other states, minus total amount sent out.)

Table 5-9. TRI Off-site Transfers Sent or Received by State, 1988.

STATE OF FACILITY	TRANSFERS SENT OFF-SITE			TRANSFERS RECEIVED IN STATE			NET EXCHANGE*
	TOTAL Pounds	IN STATE Percent	OUT OF STATE Percent	TOTAL Pounds	FROM IN STATE Percent	FROM OUT OF STATE Percent	Pounds
Alabama	15,474,062	46.99	53.01	31,325,279	23.21	76.79	-15,851,217
Alaska	202,310	82.55	17.45	282,989	59.01	40.99	-80,679
American Samoa	0	0.00	0.00	0	0.00	0.00	0
Arizona	1,578,483	34.72	65.28	1,908,751	28.71	71.29	-330,268
Arkansas	7,941,692	22.61	77.39	9,956,284	18.03	81.97	-2,014,592
California	41,237,250	82.77	17.23	36,174,806	94.35	5.65	5,062,444
Colorado	5,415,112	25.73	74.27	1,715,847	81.19	18.81	3,699,265
Connecticut	17,722,091	37.92	62.08	13,909,134	48.32	51.68	3,812,957
Delaware	2,722,103	54.96	45.04	1,496,039	100.00	0.00	1,226,064
District of Columbia	250	0.00	100.00	750	0.00	100.00	-500
Florida	14,789,622	56.23	43.77	8,742,078	95.14	4.86	6,047,544
Georgia	24,472,111	55.27	44.73	16,131,585	83.85	16.15	8,340,526
Hawaii	13,682	85.88	14.12	11,750	100.00	0.00	1,932
Idaho	136,595	32.45	67.55	456,174	9.72	90.28	-319,579
Illinois	55,444,122	56.39	43.61	60,508,541	51.67	48.33	-5,064,419
Indiana	51,466,382	60.80	39.20	62,005,792	50.47	49.53	-10,539,410
Iowa	7,467,635	38.20	61.80	2,927,873	97.43	2.57	4,539,762
Kansas	54,398,454	97.36	2.64	58,218,327	90.97	9.03	-3,819,873
Kentucky	47,787,378	39.56	60.44	34,178,605	55.32	44.68	13,608,773
Louisiana	21,897,335	90.63	9.37	45,096,545	44.00	56.00	-23,199,210
Maine	1,282,633	26.06	73.94	339,472	98.48	1.52	943,161
Maryland	5,574,470	20.02	79.98	2,986,070	37.37	62.63	2,588,400
Massachusetts	26,068,310	28.66	71.34	12,611,402	59.25	40.75	13,456,908
Michigan	95,848,610	73.63	26.37	100,083,996	70.52	29.48	-4,235,386
Minnesota	5,913,230	51.82	48.18	7,644,660	40.08	59.92	-1,731,430
Mississippi	7,693,365	7.47	92.53	937,625	61.31	38.69	6,755,740
Missouri	14,113,097	15.45	84.55	3,450,129	63.19	36.81	10,662,968
Montana	46,370	0.78	99.22	398,337	0.09	99.91	-351,967
Nebraska	3,841,681	70.49	29.51	2,814,771	96.21	3.79	1,026,910
Nevada	639,396	7.39	92.61	286,464	16.49	83.51	352,932
New Hampshire	2,098,561	6.44	93.56	484,427	27.88	72.12	1,614,134
New Jersey	68,514,999	24.85	75.15	41,416,735	41.11	58.89	27,098,264
New Mexico	210,780	15.20	84.80	162,042	19.77	80.23	48,738
New York	50,430,010	71.48	28.52	51,683,509	69.74	30.26	-1,253,499
North Carolina	20,725,143	56.02	43.98	14,075,650	82.48	17.52	6,649,493
North Dakota	101,287	5.83	94.17	5,910	100.00	0.00	95,377
Ohio	124,322,305	70.60	29.40	154,585,374	56.78	43.22	-30,263,069
Oklahoma	11,690,367	67.04	32.96	11,607,169	67.52	32.48	83,198
Oregon	5,313,630	72.04	27.96	4,521,082	84.66	15.34	792,548
Pennsylvania	83,798,182	42.81	57.19	69,438,570	51.67	48.33	14,359,612
Puerto Rico	5,015,687	99.36	0.64	4,983,693	100.00	0.00	31,994
Rhode Island	4,321,293	42.38	57.62	1,889,238	96.93	3.07	2,432,055
South Carolina	13,970,376	79.58	20.42	26,399,010	42.12	57.88	-12,428,634
South Dakota	421,384	28.56	71.44	163,083	73.80	26.20	258,301
Tennessee	21,581,214	62.80	37.20	32,828,025	41.28	58.72	-11,246,811
Texas	88,110,657	80.88	19.12	83,766,658	85.08	14.92	4,343,999
Utah	1,546,165	82.53	17.47	4,702,356	27.14	72.86	-3,156,191
Vermont	645,139	4.07	95.93	52,033	50.50	49.50	593,106
Virgin Islands	0	0.00	0.00	0	0.00	0.00	0
Virginia	13,480,493	27.74	72.26	7,461,279	50.12	49.88	6,019,214
Washington	7,330,715	82.12	17.88	6,554,322	91.85	8.15	776,393
West Virginia	18,747,276	17.45	82.55	5,403,600	60.54	39.46	13,343,676
Wisconsin	30,749,287	62.68	37.32	25,540,338	75.47	24.53	5,208,949
Wyoming	101,526	0.00	100.00	29,700	0.00	100.00	71,826
Other Transfer Locations				40,060,429			-40,060,429
TOTAL	1,104,414,307	59.51	40.49	1,104,414,307	59.51	40.49	0

*Transfers sent minus transfers received.

Table 5-10. The 10 Cities Receiving the Largest Amount of Off-site Transfers, 1988.

CITY	COUNTY	STATE	SHIPPING FACILITIES * Number	OFF-SITE TRANSFERS Pounds	Percent
WICHITA	SEDGWICK	KS	19	51,456,650	4.66
DETROIT	WAYNE	MI	356	42,334,883	3.83
DEER PARK	HARRIS	TX	318	37,787,699	3.42
BELLEVILLE	WAYNE	MI	347	25,606,742	2.32
ASHTABULA	ASHTABULA	OH	4	21,677,861	1.96
EMELLE	SUMTER	AL	519	20,410,521	1.85
CLEVELAND	CUYAHOGA	OH	428	19,313,193	1.75
QUEENSBURY	WARREN	NY	5	17,339,850	1.57
PALMERTON	CARBON	PA	18	17,261,509	1.56
GRAFTON	LORAIN	OH	156	15,918,226	1.44
SUBTOTAL				269,107,134	24.37
TOTAL FOR ALL OTHERS				835,307,173	75.63
GRAND TOTAL			9,644	1,104,414,307	100.00

*Number of facilities shipping wastes to each city. Note that because facilities can ship to more than one off-site location,some facilities may be counted more than once.

Zinc compounds made up the largest share of wastes received by Michigan Disposal, Inc. (Belleville, Michigan), and sulfuric acid was prominent at Chemical Waste Management, Inc. (Emelle, Alabama). Treatment of the wastes once received ranged from underground injection to various methods of land disposal. (See Table 5-11.)

INTERPRETING TRI TOTALS: Population and Land Area as Geographic Factors

Data on population and land area (which can be combined to yield average population density) offer a valuable tool for interpreting nationwide and statewide TRI totals. Combining land area data with TRI release totals and with population totals helps place TRI statistics into perspective. Such analyses should, however, be used with caution. Averages may mislead. For example, a state may have a very low density of TRI releases and of population, but if both the releases and the population are concentrated in a single city or county, the statewide averages will not clearly represent the actual situation.

The Density of TRI Direct Releases

The density of TRI *direct releases* in a specific geographic area represents the average number of pounds of TRI chemicals released per square mile over the course of a year. Release density data provide a general indication of levels of

Table 5-11. TRI Off-site Transfer Locations Receiving the Largest Amount of Wastes, 1988.

FACILITY NAME	CITY	COUNTY	STATE	FACILITIES SENDING WASTES Number	OFF-SITE TRANSFERS Pounds
VULCAN MATERIALS CO.	WICHITA	SEDGWICK	KS	1	51,093,000
MICHIGAN DISPOSAL, INC.	BELLEVILLE	WAYNE	MI	166	22,482,349
WAYNE DISPOSAL INC. *	BELLEVILLE	WAYNE	MI	174	2,512,952
RESERVE ENVIRONMENTAL SERVICES	ASHTABULA	ASHTABULA	OH	3	21,535,242
CHEMICAL WASTE MNGT., INC.	EMELLE	SUMTER	AL	513	20,335,009
DYNECOL, INC.	DETROIT	WAYNE	MI	36	18,793,329
SUBTOTAL					136,751,881
TOTAL FOR ALL OTHERS					967,662,426
GRAND TOTAL				9,644	1,104,414,307

*Wayne Disposal is reported as a seperate facility at the same location as Michigan Disposal

Note: The second largest single off-site transfer (not shown here) was to the Atlantic Ocean, reported by Allied-Signal, Inc., Elizabeth, NJ.

environmental releases that can be useful for comparison with other states or with statistics such as population. Keep in mind, however, that because release densities are averaged over both space and time, they do not accurately indicate the actual density of releases in any given local area. Furthermore, no average measure, such as release density, should be confused with *exposure*—the amount of chemicals that an individual citizen may actually come into contact with. Chapter 4 details the differences between chemical releases and exposure, and discusses the potential risks of TRI releases.

Louisiana facilities released to air, surface water, land, or underground an average of 14,989 pounds of TRI chemicals per square mile, more than any other state and more than ten times the national average of 1,260 pounds of TRI releases per square mile. Facilities in the Virgin Islands, Connecticut, Indiana, Ohio, Rhode Island, and New Jersey all released an average of more than 5,000 pounds of TRI chemicals per square mile. Five jurisdictions released less than 50 pounds of TRI chemicals per square mile on average: Alaska, Nevada, South Dakota, North Dakota, and the District of Columbia. (See Table 5-12.)

Louisiana facilities released almost 15,000 pounds of TRI chemicals per square mile directly to the environment.

Overall, the high and low density states reflect the same pattern observed in the data on quantities of releases and transfers: the industrialized midwest and northeast, as well as Louisiana, had high densities of TRI chemical wastes while the less industrialized, and less populated, west had much lower densities. Density analyses also reveal the high concentrations of TRI releases in small states, such as New Jersey, Connecticut, Rhode Island, Massachusetts, Puerto Rico, and the

Table 5-12. TRI Release and Population Density by State, 1988.

STATE	LAND AREA(a) Sq. Miles	POPULATION(a) Thousands	DIRECT RELEASES(b) Pounds	POPULATION DENSITY(c)	RELEASE DENSITY(c)
Alabama	51,705	4,083	67,365,412	79	1,303
Alaska	591,004	525	26,273,155	1	44
American Samoa	77	-	29,500	-	383
Arizona	114,000	3,386	68,554,330	30	601
Arkansas	53,187	2,388	63,222,530	45	1,189
California	158,706	27,663	111,722,390	174	704
Colorado	104,091	3,296	13,838,744	32	133
Connecticut	5,018	3,211	32,931,952	640	6,563
Delaware	2,044	644	5,698,813	315	2,788
District of Columbi	68	626	500	9,206	7
Florida	58,664	12,023	226,110,107	205	3,854
Georgia	58,910	6,222	98,279,750	106	1,668
Hawaii	6,471	1,083	2,115,399	167	327
Idaho	83,564	998	14,453,504	12	173
Illinois	56,345	11,582	136,706,167	206	2,426
Indiana	36,185	5,531	212,813,094	153	5,881
Iowa	56,275	2,834	44,938,969	50	799
Kansas	82,277	2,476	116,681,878	30	1,418
Kentucky	40,409	3,727	81,174,022	92	2,009
Louisiana	47,751	4,461	715,743,928	93	14,989
Maine	33,265	1,187	17,949,031	36	540
Maryland	10,460	4,535	23,806,487	434	2,276
Massachusetts	8,284	5,855	28,103,992	707	3,393
Michigan	58,527	9,200	119,999,498	157	2,050
Minnesota	84,402	4,246	53,035,977	50	628
Mississippi	47,689	2,625	111,760,882	55	2,344
Missouri	69,697	5,103	92,908,174	73	1,333
Montana	147,046	809	35,419,648	6	241
Nebraska	77,355	1,594	17,931,771	21	232
Nevada	110,561	1,007	4,215,391	9	38
New Hampshire	9,279	1,057	12,568,509	114	1,355
New Jersey	7,787	7,672	40,403,511	985	5,189
New Mexico	121,593	1,500	24,151,925	12	199
New York	49,108	17,825	96,032,605	363	1,956
North Carolina	52,669	6,413	108,638,688	122	2,063
North Dakota	70,703	672	1,240,612	10	18
Ohio	41,330	10,784	229,473,876	261	5,552
Oklahoma	69,956	3,272	39,605,430	47	566
Oregon	97,073	2,724	21,222,827	28	219
Pennsylvania	45,308	11,936	101,866,198	263	2,248
Puerto Rico	3,515	3,274	15,795,208	931	4,494
Rhode Island	1,212	986	6,317,637	814	5,213
South Carolina	31,113	3,425	65,518,755	110	2,106
South Dakota	77,116	709	2,481,361	9	32
Tennessee	42,144	4,855	203,212,545	115	4,822
Texas	266,807	16,789	595,907,459	63	2,233
Utah	84,899	1,680	135,025,920	20	1,590
Vermont	9,614	548	1,656,692	57	172
Virgin Islands	132	-	1,633,634	-	12,376
Virginia	40,767	5,904	144,434,862	145	3,543
Washington	68,138	4,538	42,029,962	67	617
West Virginia	24,231	1,897	35,815,259	78	1,478
Wisconsin	56,153	4,807	51,893,559	86	924
Wyoming	97,809	490	45,353,102	5	464
TOTAL	3,622,425	246,051	4,566,065,131	68	1,260

(a) Land area and population statistics are from Tables 331 and 22 of *Statistical Abstract of the United States*, (Washington DC: U.S. Department of Commerce, Bureau of the Census, 1989).
(b) Direct releases include air emissions, surface water discharges, land disposal, and underground injection.
(c) Population density refers to people per square mile. Release density refers to pounds per square mile.

Virgin Islands that are not so readily apparent when quantities alone are considered. (See Map 5-10.)

Release Density Compared to Population Density

Six jurisdictions in the U.S. have population densities that are greater than 500 people per square mile: New Jersey, Puerto Rico, Rhode Island, Massachusetts, Connecticut, and the District of Columbia. This list overlaps with the list of states with the highest density of facilities. In addition, four jurisdictions with the highest population densities, New Jersey, Puerto Rico, Rhode Island, and Connecticut, are also among the states with the highest density of TRI releases. (See Figure 5-8, and compare Maps 5-10 and 5-11.)

High population densities coincide with high release densities in New Jersey, Puerto Rico, Rhode Island, and Connecticut.

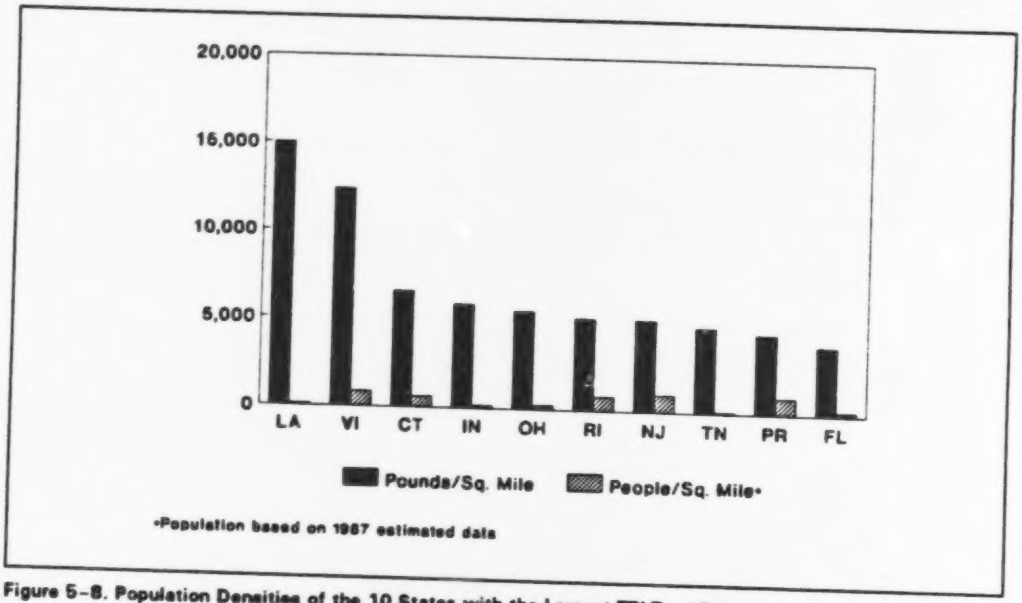
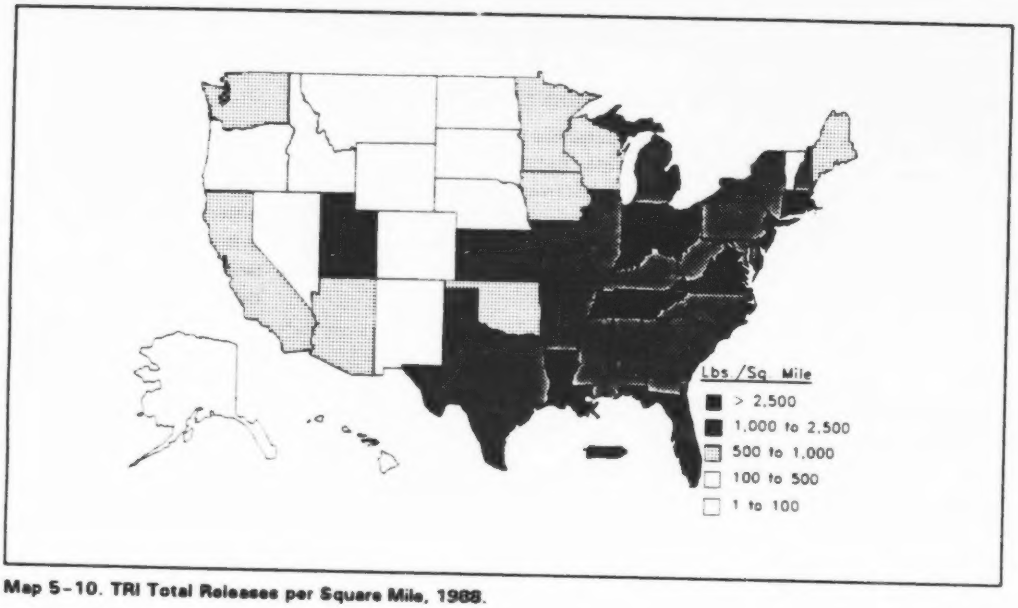
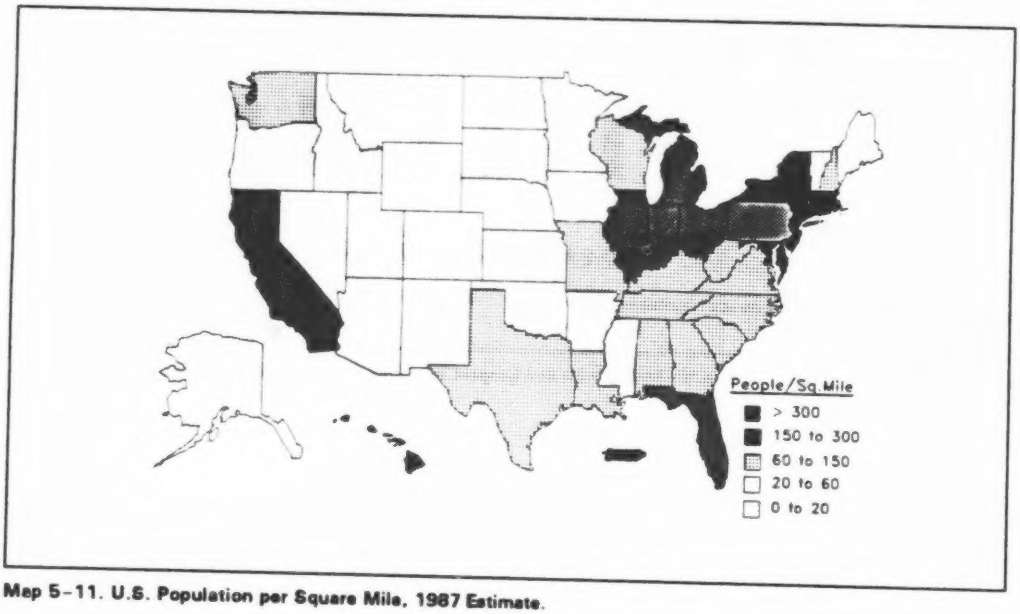


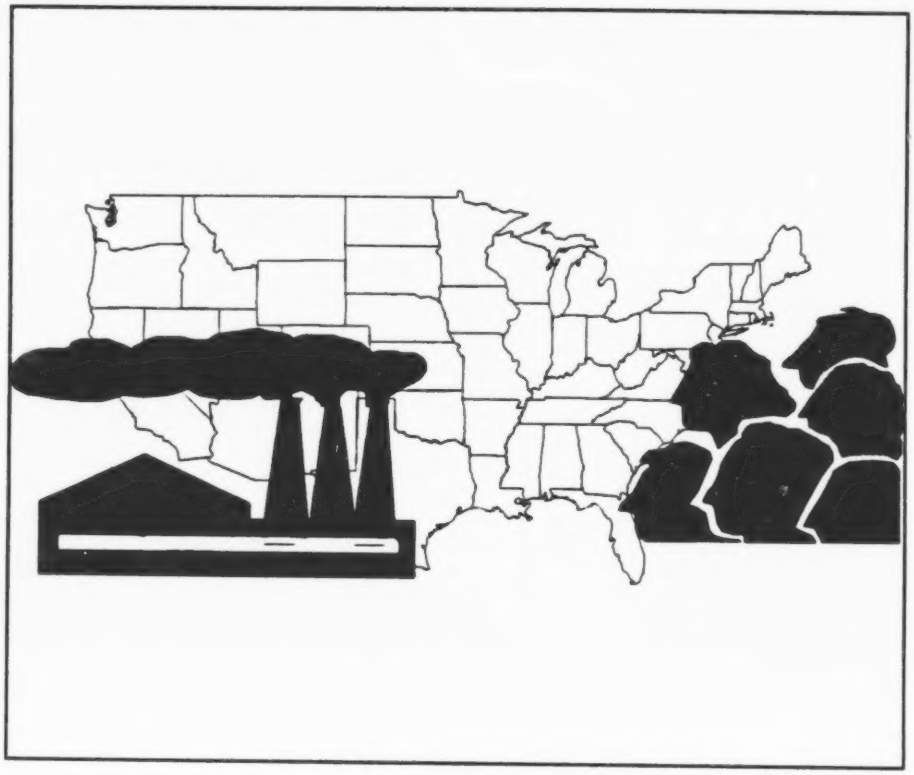
Figure 5-8. Population Densities of the 10 States with the Largest TRI Total Releases per Square Mile, 1988.


Lbs./Sq. Mile
> 2,500
1,000 to 2,500
500 to 1,000
100 to 500
1 to 100

Map 5-10. TRI Total Releases per Square Mile, 1988.


People/Sq.Mile
> 300
150 to 300
60 to 150
20 to 60
0 to 20

Map 5-11. U.S. Population per Square Mile, 1987 Estimate.



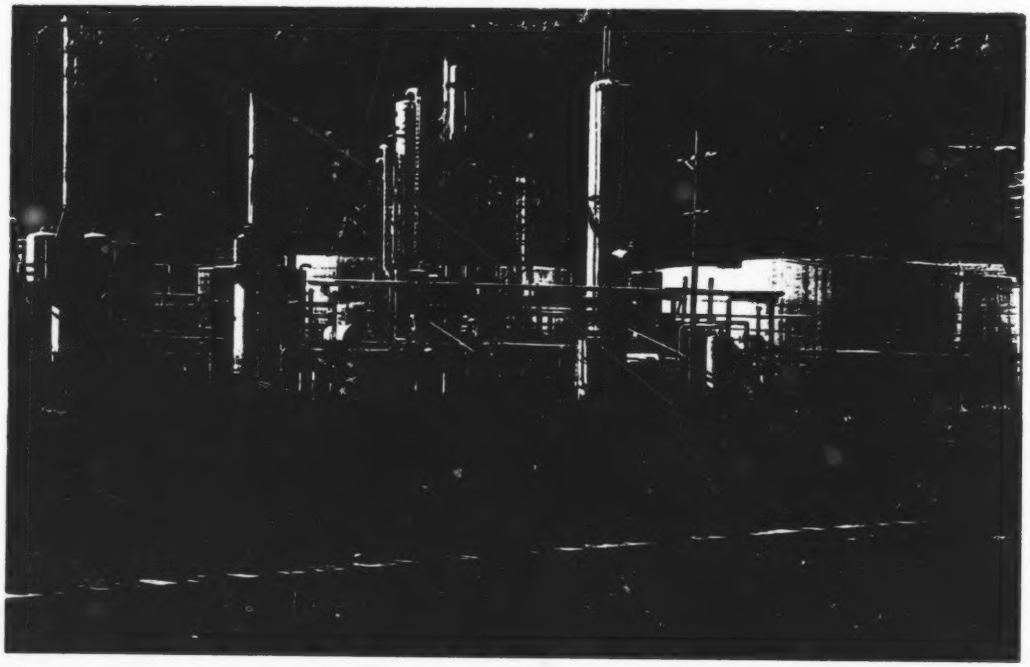


Photo: Daniel J. Kasztel.

CHAPTER 6. INDUSTRIAL PATTERNS OF TOXIC RELEASES AND TRANSFERS, 1988

The Chemical industry dominated total releases and transfers nationwide, accounting for almost half (46 percent) of the 1988 total reported to the Toxics Release Inventory (TRI) for 1988. The 3,838 Chemical facilities that reported to TRI represented 19 percent of all TRI facilities, with releases and transfers prominent in many states. This chapter tells the tale of the leading role played by the Chemical industry, but also looks at the more detailed patterns of industrial releases hidden behind the overall totals, including where different industries released TRI chemicals, how industrial releases and transfers are distributed to the environment, and which chemicals constitute the various industry totals.

Industry groups discussed in this report are based on two-digit Standard Industrial Classification code (SIC code), briefly described in Appendix C, unless otherwise indicated. The SIC code system was developed by the U.S. Office of Management and Budget to identify industrial sectors. Two-digit SIC code groups comprise broad industrial sectors. For example, SIC 28, the Chemicals and Allied Products category, covers the manufacture of everything from pharmaceuticals to plastics and synthetic rubber to printing inks. Note, however, that TRI forms request that facilities indicate their SIC codes up to four digits, which allows for analysis of more specific industrial sectors (see Chapter 12).

In 1988 as in 1987, the Chemicals and Allied Products industry generated more TRI releases and transfers than any other industry, with a total of 2.9 billion pounds or 46 percent of the TRI total for all industries. This was more than three times that of the second-ranked industry: Primary Metals with 857.9 million pounds. Diversified facilities that reported more than one industry category[1] (*Multiple codes*) ranked third, with 579.5 million pounds (nine percent), followed by the Paper and Allied Products industry (370.3 million pounds, or six percent). (See Figure 6-1 and Table 6-1.)

The Chemical industry generated almost 1/2 of the 1988 TRI totals, and the Primary Metals industry produced another 1/7.

Within the broad category of Chemical manufacturers (SIC 28), the Industrial Organic sector (SIC 2869) and the Inorganic Pigments sector (SIC 2816) generated the largest releases and transfers (305.3 and 218.9 million pounds,

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(1) Facilities were permitted to list as many SIC codes as categorized their manufacturing activities. Diversified facilities—those that reported more than one major (two-digit SIC) code—are categorized in this report as Multiple (or Multiple SIC codes in 20-39) in this report.

Table 6-1. TRI Facilities, Forms, and Releases and Transfers by Industry, 1987 and 1988

SIC CODE	INDUSTRY	FACILITIES		FORMS		AVERAGE NO. OF CHEMICALS (a)	MAXIMUM NO. OF CHEMICALS (b)
		1988	1987	1988	1987		
20	Food	1,452	1,274	2,649	2,390	2	10
21	Tobacco	19	21	62	55	3	11
22	Textiles	401	386	890	817	2	14
23	Apparel	29	26	49	47	2	5
24	Lumber	616	599	1,719	1,661	3	14
25	Furniture	397	366	1,556	1,368	4	18
26	Paper	587	573	2,328	2,134	4	16
27	Printing	313	290	623	567	2	8
28	Chemicals	3,838	3,786	20,332	19,075	5	86
29	Petroleum	364	333	3,053	2,939	8	35
30	Plastics	1,293	1,188	3,213	2,837	2	28
31	Leather	132	116	372	405	3	11
32	Stone/Clay	559	516	1,315	1,381	2	33
33	Primary Metals	1,380	1,327	5,446	5,166	4	45
34	Fab. Metals	2,579	2,443	7,860	7,244	3	21
35	Machinery	870	809	2,315	2,119	3	26
36	Electrical	1,578	1,468	5,047	4,637	3	23
37	Transportation	1,054	927	4,447	4,248	4	25
38	Measure./Photo.	344	320	1,000	978	3	63
39	Miscellaneous	372	349	946	879	3	16
	Mult. codes 20 - 39	1,303	1,336	5,133	4,662	4	45
	No codes 20 - 39	282	393	776	1,148	3	39
	TOTAL	19,762	18,846	71,131	66,757	4	86

(a) Average number of chemicals per facility is derived by dividing total number of forms submitted for an industry by the total number of facilities in that industry.

(b) Maximum number of chemicals per facility indicates how many chemicals were reported by the facility submitting the most forms in each industry.

respectively). Blast Furnaces (SIC 3312) were responsible for the largest share of the Primary Metals industry total (219.3 million pounds). (See Table 6-2.)

In contrast to the large amounts generated by the top four manufacturing industries, the nine industries with the smallest TRI releases and transfers together accounted for slightly over five percent of the TRI total. The Apparel industry reported the smallest amount, 1.9 million pounds—less than one percent of the TRI total.

Reports from facilities in more than one industrial category may lead to underestimates of the amounts of chemicals released or transferred by some industries. For instance, the Chemical industry was frequently one of the two (or more) industries reported by facilities with multiple classifications, but the releases from those facilities cannot be assigned to the Chemical industry, since it is not known what portion of the TRI data originated from chemical operations and what portion from other activities. (See Box 6-A for examples of Multiple Code facilities.)

Some 282 facilities that did not report a manufacturing SIC code (20-39) released and transferred 23.1 million pounds of TRI chemicals (less than one-half of one

Table 6-1, continued.

INDUSTRY	TOTAL RELEASES AND TRANSFERS 1988 Pounds	Percent	Rank	1987 Pounds	Percent	Rank	AVERAGE RELEASES AND TRANSFERS (c) 1988 Pounds	Rank	1987 Pounds	Rank
Food	72,901,891	1.17	11	67,048,081	0.96	15	50,208	22	52,628	22
Tobacco	15,058,947	0.24	21	7,268,625	0.10	21	792,576	1	346,125	7
Textiles	59,325,071	0.95	15	68,613,808	0.98	14	147,943	12	177,756	11
Apparel	1,919,695	0.03	22	2,650,724	0.04	22	66,196	20	101,951	16
Lumber	33,368,043	0.53	19	31,804,406	0.46	20	54,169	21	53,096	21
Furniture	62,795,289	1.01	13	61,182,687	0.88	17	158,175	11	167,166	12
Paper	370,343,051	5.93	4	377,958,408	5.42	4	630,908	3	659,613	3
Printing	60,541,926	0.97	14	63,380,815	0.91	16	193,425	9	218,555	10
Chemicals	2,883,479,294	46.20	1	3,331,892,430	47.75	1	751,297	2	880,056	1
Petroleum	104,236,707	1.67	9	182,108,630	2.61	5	286,365	7	546,873	4
Plastics	189,126,061	3.03	7	190,996,017	2.74	9	146,269	13	160,771	13
Leather	37,806,234	0.61	17	41,965,475	0.60	18	286,411	6	361,771	6
Stone/Clay	55,182,710	0.88	16	57,634,258	0.83	11	98,717	15	111,694	15
Primary Metals	857,866,507	13.75	2	947,963,814	13.59	2	621,642	4	714,336	2
Fab. Metals	215,112,500	3.45	6	233,597,136	3.35	7	83,409	18	95,619	19
Mach, except Electrical	75,332,062	1.21	10	78,172,754	1.12	12	86,589	17	96,629	18
Electrical	182,384,794	2.92	8	220,944,128	3.17	8	115,580	14	150,507	14
Transportation	261,180,095	4.18	5	296,186,174	4.24	6	247,799	8	319,510	8
Measure./Photo.	64,367,648	1.03	12	78,145,426	1.12	13	187,115	10	244,204	9
Miscellaneous	36,043,356	0.58	18	35,558,546	0.51	19	96,891	16	101,887	17
Mult. codes 20 - 39	579,516,521	9.29	3	579,638,062	8.31	3	444,756	5	433,861	5
No codes 20 - 39	23,142,344	0.37	20	22,722,138	0.33	10	82,065	19	57,817	20
TOTAL	6,241,030,746	100.00		6,977,432,542	100.00					

(c) Average TRI releases/transfers per facility is derived by dividing the total pounds of releases and transfers for that industry by its number of TRI facilities reporting. See text for discussion of how this average may be distorted by the influence of a few facilities.

percent of the 1988 TRI total). Some of these facilities may not have been required to report to TRI, while others may have filled out their forms incorrectly or incompletely.[2] Some were Federal facilities that, while not legally required to report to TRI, did so voluntarily, as described below.

Data analyses presented in this chapter, as throughout the report, are based on the April 6, 1990 version of EPA's TRI database; the statistics may differ slightly from those in publicly-available data sources. In addition, various analyses are affected by changes in the TRI database that have been made since data for this report were compiled. These changes are summarized in Chapter 3, Box 3–A; the change that most affects analyses of industrial distribution is detailed in Box 6–B.

[2] This category includes facilities with blank or incorrect SIC codes as well as ones with codes other than 20–39. There are four possible reasons for which facilities might be included in this category: 1) they did not fill out the SIC section of their TRI forms completely or correctly; 2) they were not among SIC codes 20–39 but did not understand that they were not required to report; 3) they were not among SIC codes 20–39 but they have voluntarily reported their use of TRI chemicals; 4) they reported SIC codes in 20–39 but the data were entered into the EPA TRI database incorrectly.

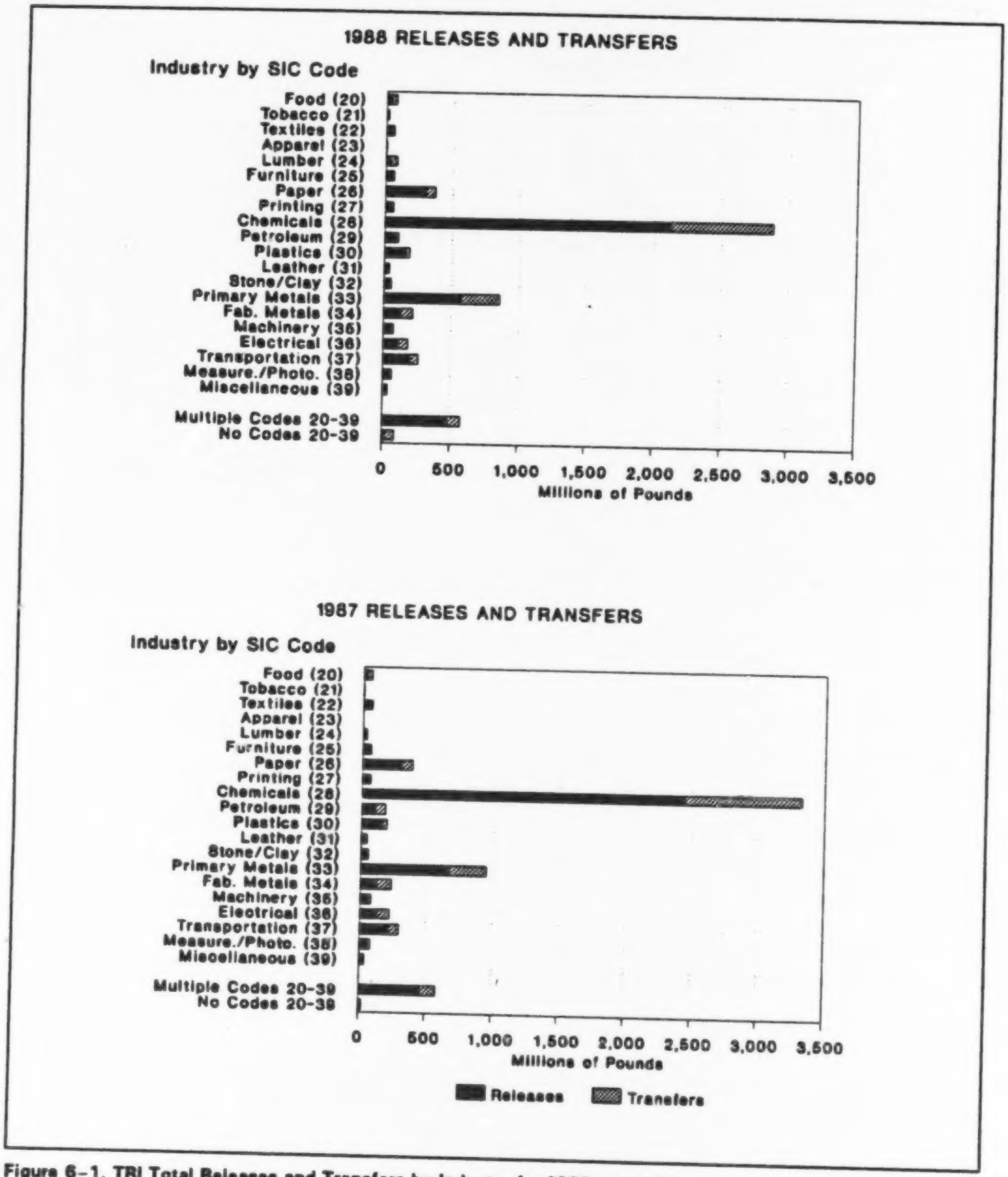

Figure 6-1. TRI Total Releases and Transfers by Industry for 1988 and 1987.

BOX 6-A. FACILITIES REPORTING MULTIPLE SIC CODES

TRI facilities reported as many as seven different four-digit SIC codes (see Appendix C). While many of these were all in the same two-digit category, seven percent of the facilities reported multiple SIC codes that fell into more than one two-digit category.

Shell Oil Company's Norco Manufacturing Complex in Norco, Louisiana, led the Multiple Codes industrial group, with a 1988 total of 158.7 million pounds of releases and transfers, the second greatest amount from any facility. It reported as both a Chemical Products facility (SIC 28) and as a Petroleum Refiner (SIC 29). If it had been solely a Chemical facility, it would have ranked second after American Cyanamid (also in Louisiana) in that industry; if it had been solely in the Petroleum Refining category, it would have overwhelmed that industry, since it reported a greater amount than all of the other facilities in that industry combined.

The facility reported releasing 24 chemicals, mostly through underground injection (156.4 million pounds, 99 percent), making it the second-ranked facility nationwide for total underground injection. Most of the plant's disposal (152.8 million pounds) was hydrochloric acid. Almost two million pounds of fugitive air emissions were reported for 19 chemicals, with the greatest amount (42 percent) being propylene. Lesser amounts were distributed among all the other types of releases and transfers, except there were no transfers to public sewage treatment plants.

Inland Steel Company, in East Chicago, Indiana, reported the next greatest TRI amounts from Multiple Code facilities—61.4 million pounds—which made it the tenth-ranking TRI facility. It reported under Primary Metals (SIC 33) (with the four-digit SIC code 3312 for Blast furnaces and steel mills) and under Stone/Clay/Glass Products (SIC 32) (with the 3274 code for Lime operations). The facility's total amounts exceeded those of all other Primary Metals facilities except the top one (Amax Magnesium, Tooele, Utah, with 109.8 million pounds) and was more than nine times greater than any facility solely reporting under SIC code 32. This facility also produced the second greatest increase in TRI totals from 1987 to 1988—29.9 million pounds, a 95 percent increase.

Inland Steel's releases and transfers were only slightly more diversified than those of the Shell Oil facility. Inland Steel reported more than one million pounds of releases or transfers for five chemicals. The facility ranked first in the nation in total amounts of on-site land releases. Manganese compounds, which accounted for 43.0 million pounds (70 percent of the total), were mostly disposed of in on-site landfills. The other chemicals were released in amounts over one million pounds; their principal means of disposal were underground injection (hydrochloric acid), on-site land (zinc compounds and chromium compounds), and air, mostly fugitive, emissions (benzene).

BOX 6-B. WHAT AN ERROR IN THE DATABASE CAN DO: THE GEORGIA-PACIFIC CASE

Because the TRI database contains detailed information on up to an average of four chemicals per facility from over 19,000 facilities in 22 major industrial categories and in 54 states and territories, occasional errors are not unexpected. These might be made by manufacturers when filling out the reporting forms or they might be made when data are entered into the national database or extracted and combined for further analysis. Chapter 2 explains some of the many corrections that have been made to the 1987 database since the June 1989 published report.

Occasionally an error is of sufficient magnitude to distort even aggregate analyses. One such error is 1988 data for Georgia-Pacific Corporation in Brunswick, Georgia. (Other changes and corrections are briefly described in Chapter 3, Box 3-C.) That facility reported in 1987 under the two-digit SIC code 26 (Paper and Allied Products), (although under the facility name of Brunswick Pulp and Paper Company).

During preparation of this 1988 report, however, Georgia-Pacific kept appearing as an odd facility in the Tobacco industry, SIC Code 21. Its 1988 TRI amounts, totaling 11.4 million pounds, would not have attracted as much attention in the large paper industry, where such an amount would be about three percent of the industry total reported by 551 facilities. In the Tobacco industry, however, it was one of only 19 facilities, and that amount represented 76 percent of the total. Once this was observed, combined with the well-recognized identity of Georgia-Pacific as a major pulp and paper company, the detailed TRI information for this facility was examined more closely. Apparently, the correct *four-digit* SIC code of 2610 (Pulp Mills) had been inadvertently transposed to 2160, turning it into a Tobacco facility.

The error was corrected too late to be incorporated into the major data analyses in this report. The incorrect placement of the facility's data is reflected in all tables and figures in this report, but noted in the text where it would make a major difference. Anyone using the TRI database in its present form should be aware of this error when drawing conclusions about totals or rankings for these two industries or the principal chemicals and types of releases reported (mostly point source air emissions of methanol). The following is a summary of the 1988 Georgia-Pacific data and some of the changes that would result in national observations from correction of the error.

1988 total for all chemicals at facility (in pounds):

- Fugitive air emissions 314,410 (310,000 is chloroform)
- Point source air emissions 11,072,410 (9,200,000 is methanol; acetone and chlorine are next highest amounts)
- Surface water discharges 19,640 (16,000 is chromium compounds)
- On-site land disposal 14,001 (13,000 is chromium compounds)
- Total Releases/Transfers 11,420,461

BOX 6-B (continued).

Some Changes That Would Result From Correction:

- The facility would rank second in the Paper industry in total releases and transfers instead of first in the Tobacco industry.
- The Tobacco industry TRI totals would decrease 76 percent, from 15.1 million to 3.6 million pounds, but the Paper industry totals would increase only three percent, from 370.3 million to 381.8 million pounds. The rankings of both industries in total TRI amounts (twenty-first and fourth) would remain the same.
- The Tobacco industry's average releases/transfers per facility would decrease from 792,576 to 202,138 pounds, changing its ranking in that category from first to eighth. The average releases per facility would increase slightly for the Paper industry but not affect its third-place ranking.
- Air emissions would account for 67 percent of the Tobacco total rather than 92 percent; the Tobacco industry would continue to be in second-to-last place for total air amounts. The overall effect of the additional air emissions to the Paper industry would be minimal. Changes to average air releases per facility would be more dramatic: the Tobacco average would decrease from 727,393 to 135,202 pounds, so it would rank ninth by this criterion rather than first; the Paper industry would now rank first in air releases per facility rather than second (with 386,952 pounds).
- The Tobacco industry would contribute 0.7 million pounds of methanol (0.2 percent of total TRI methanol, the nineteenth greatest amount) rather than 9.9 million pounds (two percent, the seventh greatest amount); the Paper industry share would increase slightly, from 27 to 29 percent, and it would still be second to the Chemical industry in methanol amounts.

CHEMICAL COMPOSITION

The average number of different chemicals reported by each facility in a given industry was four. However, the Petroleum Refining industry reported an average of eight different chemicals per facility in 1988, with a maximum of 35 chemicals reported from any one facility, and the Chemical industry reported an average of five chemicals per facility and a maximum of 86, from the Dow Chemical plant in Freeport, Texas. Overall, 18,746 facilities, or 95 percent of the total number of reporting facilities, reported ten or fewer chemicals. (See Table 6-1 and Box 6-C.)

TRI facilities reported an average of 4 chemicals per facility; for the Petroleum industry the average was 8.

Major Chemicals

While the Chemical industry generated the top amounts of many chemicals, the industrial distribution of the 25 chemicals with the largest TRI totals (which accounted for 83 percent of total releases and transfers nationwide) varied considerably. Some of these chemicals, such as 1,1,1-trichloroethane and methyl ethyl ketone, were released in significant amounts by facilities in many industries, without one industry dominating. For example, 18 industries reported more than

Sulfuric acid, toluene, and acetone were released in significant amounts by facilities in all industries . . .

BOX 6-C. FACILITIES REPORTING THE MOST TRI CHEMICALS

A Dow Chemical Company facility in Freeport, Texas, reported on the greatest number of TRI chemicals in 1988 (86 chemicals), although its total TRI amount of 9.5 million pounds was not particularly unusual for a chemical plant. (Each of the top ten TRI chemical plants in the country reported over 60 million pounds of releases and transfers in 1988.)

This facility reported seven chemicals released or transferred in amounts greater than 500,000 pounds: hydrochloric acid (1.7 million pounds), ethylene (1.3 million pounds), chlorine (749,000 pounds), acetone (676,000 pounds), 4,4'-isopropylidenediphenol (570,000 pounds), dichloromethane (560,000 pounds), and 1,1,1-trichloroethane (521,000 pounds). At the other extreme it reported zero pounds for five chemicals (that is, the chemicals were used in amounts that needed to be reported to TRI but not released to the environment or transferred off-site in reportable ways), and released or transferred under 1,000 pounds each of 26 other chemicals.

Most of Dow Chemical's releases were to the air: 5.3 million pounds of point source air emissions and another 2.5 million pounds of fugitive air emissions, or a total of 81 percent of its TRI chemicals going to the air. As a result, the facility ranked 22nd in the nation for total air releases, 21st for fugitive air releases, and 27th for point source air releases. Another 1.3 million pounds were transferred off-site, 509,000 pounds released to surface waters, and under 10,000 pounds released on-site to land. The facility reported no underground injection or transfers to public sewage treatment plants.

The amounts and distribution among media and chemicals were quite similar in 1987 and 1988. The 1988 total represented a decrease of four percent (356,000 pounds) compared to 1987. The facility did not lead in number of chemicals reported in 1987, however, since that year it reported 76 chemicals.

Tennessee Eastman Company, an Eastman Kodak facility in Kingsport, Tennessee, reported on the second greatest number of TRI chemicals in 1988 (81 chemicals). It had led in number of chemicals reported in 1987 (82 chemicals, including ones since removed from the TRI list). Their total of 42.7 million pounds of total 1988 TRI releases and transfers ranked 16th for the Chemical industry and 20th for all types of TRI facilities. This represents a slight decrease of one percent since 1987.

This facility reported some of each type of release and transfer except underground injection. Despite the number of chemicals and varieties of environmental methods of disposal of the wastes, most of the amounts were fugitive air emissions of a single chemical: 30.8 million pounds of acetone, or 72 percent of the facility total. Tennessee Eastman reported five other chemicals in amounts of between one and four million pounds each: methanol, ethylene glycol, methyl isobutyl ketone, toluene, and butyraldehyde. The other 75 chemicals varied in amounts from zero releases to under ten pounds to several hundred thousand pounds each.

Table 6-2. The 25 Industries (Classified by 4-Digit SIC Code) with the Largest TRI Total Releases and Transfers by Type of Release or Transfer, 1988.

TRI TOTAL RANK	SIC CODE	INDUSTRY	FACILI-TIES*	FORMS**	TRI TOTAL	AIR	SUR-FACE WATER	LAND	UNDER-GROUND	PUBLIC SEWAGE	OFF-SITE
			Number	Number	Pounds	Percent	Percent	Percent	Percent	Percent	Percent
1	2869	Industrial organic chemicals, nec**	407	2,147	305,332,220	20.30	0.82	0.50	55.02	11.18	12.18
2	3312	Blast furnaces and steel mills	160	1,044	219,312,953	15.34	3.21	25.32	15.26	1.12	39.75
3	2816	Inorganic pigments	61	217	218,856,672	8.02	0.07	1.65	38.61	31.64	20.02
4	3339	Primary nonferrous, nec**	32	100	195,683,490	57.90	3.11	37.79	0.02	0.00	1.18
5	2873	Nitrogenous fertilizers	77	239	142,353,293	87.40	4.95	1.78	5.66	0.19	0.03
6	2819	Industrial inorganic chemical, nec**	378	935	126,183,400	18.99	6.40	27.74	4.29	24.25	18.33
7	3331	Primary copper	10	71	113,736,045	4.65	0.05	95.20	0.00	0.03	0.06
8	2611	Pulp mills	89	204	105,782,221	15.42	75.00	0.73	0.00	5.87	3.00
9	2911	Petroleum refining	191	2,328	86,310,204	48.98	3.83	3.21	22.97	11.04	9.97
10	3711	Motor vehicles and car bodies	98	880	73,381,852	84.05	0.06	0.06	0.00	2.05	13.79
11	2821	Plastics materials and resins	439	1,766	71,843,994	58.96	1.78	0.13	0.12	6.56	32.45
12	3079	Miscellaneous plastics products	473	1,058	61,093,502	86.58	0.34	0.05	0.00	1.35	11.67
13	2874	Phosphatic fertilizers	36	110	57,483,136	17.55	2.78	79.51	0.00	0.00	0.15
14	2834	Pharmaceutical preparations	143	402	55,328,526	40.98	3.48	4.10	9.12	14.98	27.35
15	2851	Paints, varnishes, lacquers, enamels, 586	2,696	53,641 ,800	40.97	0.01	0.04	0.00	4.30	54.69	
16	2621	Paper mills	159	544	53,414,908	67.81	3.94	3.05	0.00	14.15	11.05
17	2813	Industrial Gases	132	197	53,218,118	3.42	0.09	0.00	0.01	0.08	96.40
18	2823	Celluosic manmade fibers	3	27	47,696,335	91.92	0.39	7.58	0.00	0.00	0.12
19	3714	Motor vehicle parts and accessories	353	1,056	44,781,891	57.35	0.20	1.05	0.00	6.19	35.22
20	2865	Cyclic crude and intermediates	111	566	41,294,579	22.73	0.41	0.61	0.16	56.52	19.57
21	3679	Electronic components, nec**	267	690	41,290,330	81.03	0.11	0.00	0.00	7.05	11.81
22	2631	Paperboard mills	74	265	40,905,315	59.77	1.32	8.34	0.00	30.20	0.37
23	3861	Photographic equipment and supplies	57	285	40,705,368	66.95	1.57	0.77	0.00	10.51	20.21
24	2511	Wood Household Furniture	191	853	39,363,005	95.89	0.00	0.12	0.00	0.18	3.81
25	2899	Chemicals and Allied Products, nec**	316	1,007	38,833,002	9.87	0.28	2.20	69.82	7.80	10.02
		SUBTOTAL	4,843	19,687	2,327,826,159						
		TOTAL FOR ALL OTHERS	14,919	51,444	3,913,204,587						
		GRAND TOTAL	19,762	71,131	6,241,030,746						

*Only facilities and forms reporting a single SIC code were counted.
**Not elsewhere classified

one million pounds of methyl ethyl ketone, and no one industry's share exceeded 13 percent. Three particularly widespread chemicals were sulfuric acid, toluene, and acetone: TRI totals for every industry contained at least 100,000 pounds of each. Although the Chemical industry contributed almost one quarter of the toluene total, only three industry groups had industry-wide totals of less than one million pounds of toluene releases and transfers. The Chemical industry also provided the largest share of sulfuric acid releases and transfers (47 percent) and of acetone (44 percent); Primary Metals facilities reported another 23 percent of the sulfuric acid total. (See Figure 6–2 and Table D–6 in Appendix D.)

Other chemicals were reported by only a few industries. For example, overall the Chemical industry generated 47 percent of the TRI totals. However, it generated 97 percent of the releases and transfers of ammonium nitrate, 90 percent of the phosphoric acid, 84 percent of the carbon disulfide, 83 percent of the ammonium sulfate, 66 percent of the ammonia, and 62 percent of ethylene glycol.

. . . while other chemicals were discharged primarily by a single industry.

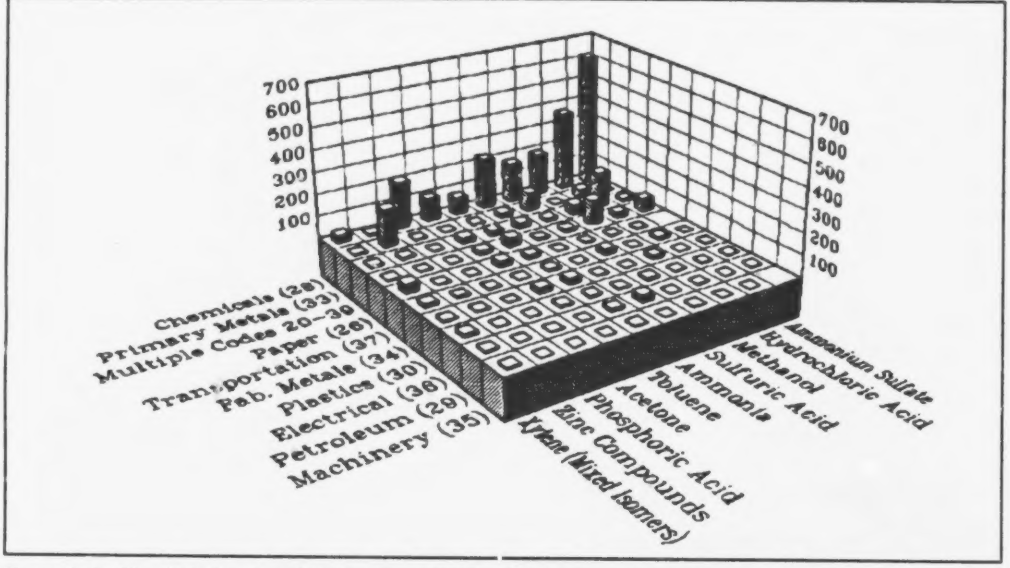

Figure 6-2. The 10 Industries with the Largest TRI Total Releases and Transfers and Top 10 Chemicals. (Chemicals released and transferred in the largest amounts, shown in million of pounds.)

TRI totals for chlorine came primarily from 4 industries: Primary Metals, Fabricated Metals, Paper Products, and Chemicals and Allied Products.

The Primary Metals industry contributed 12 percent of the total for the top 25 chemicals—or slightly less than its share of total TRI releases and transfers (14 percent)—including 171.8 million pounds of zinc compounds (82 percent of the reported releases and transfers for that chemical category) and 53.8 million pounds of zinc (81 percent), 41.0 million pounds of copper compounds (77 percent), and 106.7 million pounds of chlorine (73 percent). Releases and transfers of chlorine originated almost entirely from three industries: Paper Products (12 percent), Chemical Products (ten percent), and Primary Metals. (See Figure 6-3.)

Diversified facilities (those reporting multiple SIC codes) reported 45 percent (51.9 million pounds) of the total for manganese compounds and 27 percent (169.8 million pounds) of the total for hydrochloric acid. (See Boxes 6-A and 6-D, and Table D-6 in Appendix D for additional details on the individual chemicals that made up the TRI totals for each industry.)

BOX 6-D. ADDITIONAL CHEMICAL HIGHLIGHTS, 1988

While the 25 top chemicals made up 83 percent of total TRI releases and transfers for 1988 (Table 6-5 in Appendix D), other chemicals stand out because of the amounts they contribute to a particular industry, or because one or only a few industries contribute most of the total reported TRI releases and transfers. The following are highlights of the chemical distribution among and within some industries. They are not intended to be inclusive or necessarily of greatest environmental or public health importance.

Textile Mill Products: The 83,000 pounds of biphenyl reported by Textile facilities represented 0.9 percent of the total TRI releases and transfers for that chemical.

Apparel: This industry reported no chemicals (either in or out of the top 25) in amounts greater than *one-half* million pounds. However, its 303,000 pounds of tetrachloroethylene, a carcinogen, equaled 0.9 percent of the industry's total for all chemicals.

Paper Products: The two chemicals outside the top 25 that were reported by Paper industry facilities in excess of *ten* million pounds represented substantial releases and transfers of those chemicals: 11.1 million pounds (82 percent) of chlorine dioxide and 18.4 million pounds (69 percent) of chloroform, a carcinogen.

Chemical Products: This industry reported releases and transfers greater than *ten* million pounds for an additional 12 chemicals outside the top 25. Of these, eight accounted for over half of the total releases of the chemical: carbonyl sulfide (19.1 million pounds, just under 100.0 percent), acrylic acid (23.3 million pounds, just under 100 percent), acetonitrile (23.1 million pounds, 98 percent), acrylonitrile (10.3 million pounds, 95 percent), ethylene (36.9 million pounds, 89 percent), propylene (15.9 million pounds, 68 percent), formaldehyde (18.1 million pounds, 59 percent), and barium compounds (11.1 million pounds, 53 percent). (The others were phenol, styrene, n-butyl alcohol, methyl isobutyl ketone, and benzene.) In addition, Chemical manufacturers reported more than *one* million pounds for 59 chemicals outside the top 25.

Petroleum Refining: This industry uses various chemicals in large quantities: Petroleum manufacturers reported amounts greater than *one* million pounds for ten chemicals outside of the top 25, and for seven within the top 25. Among them were benzene (4.7 million pounds, 14 percent of total releases and transfers for the industry) and propylene (4.4 million pounds, 19 percent).

Stone/Clay/Glass Products: This industry's 6.8 million pounds of releases and transfers of friable asbestos, a carcinogen, comprised 30 percent of total TRI releases and transfers of that substance. In addition, the industry accounted for almost half of all reported mixtures (6.6 million pounds).

Primary Metals: The Primary Metals industry reported eight chemicals outside the top 25 in excess of *ten* million pounds, a number second only to the 12 of the Chemical industry. Not surprisingly,

BOX 6-D (continued).

many of these were metals. The industry reported 91 percent of TRI totals for aluminum fume or dust (38.5 million pounds), 69 percent of the lead compounds (24.9 million pounds) and another 71 percent of the lead (15.9 million pounds), 61 percent of the manganese (27.1 million pounds), 55 percent of the copper (19.0 million pounds), and 38 percent of the chromium compounds (9.9 million pounds). The industry also accounts for a sizable share of the metals within the top 25: zinc compounds (148.6 million pounds, 81 percent) and zinc fume or dust (48.4 million pounds, 82 percent), copper compounds (41.0 million pounds, 77 percent), manganese compounds (39.4 million pounds, 34 percent), and chromium (9.9 million pounds, 47 percent). The industry also contributed 34 percent (11.4 million pounds) of the carcinogen benzene.

Fabricated Metals: Seven chemicals outside the top 25 were reported in excess of *one* million pounds, five of them metals (manganese, copper, chromium compounds, chromium, and nickel).

Transportation Equipment: This industry reported one chemical outside the top 25 in amounts greater than *ten* million pounds: the carcinogen styrene (13.7 million pounds, 32 percent of that chemical). Manufacturers in the industry also generated more than *one* million pounds of 10 other chemicals outside the top 25 and 17 within the top 25.

Measuring/Photographic: This industry's 1.5 million pounds of ethylene oxide, a carcinogen, was 30 percent of the TRI total for that chemical and the only chemical reported by this industry outside the top 25 in amounts greater than *one* million pounds.

Chemical Classes

70% of acids/bases/salts came from the Chemical industry, the Primary Metals industry generated 64% of the metals; halo-organics and organics were more evenly distributed among industries.

The Chemical industry dominated total releases and transfers for all chemical classes except metals, to which the Primary Metals industry understandably contributed the most—64 percent. (See Chapter 4 for an explanation of chemical classes.) The 1.6 billion pounds of acids/bases/salts reported from Chemical facilities represented 70 percent of that class. Facilities reporting Multiple SIC Codes reported the second highest amounts of acids/bases/salts, of metals and metal compounds, and of halo-organics. The Paper industry was second for organics, and Primary Metals was second for non-metallic inorganics. Most mixtures were reported by the Stone/Clay/Glass industry (12 percent) and the Primary Metals industry (49 percent). The distribution among industries varied from class to class, but did not change significantly from 1987 to 1988. Halo-organic and organic chemicals, for example, were distributed among many industries, possibly because many of these chemicals are used as solvents and degreasers, which have applications in many industrial sectors. (See Table 6-3.)

Table 6-3. Industrial Distribution of TRI Releases and Transfers by Chemical Class, 1988.

SIC CODE	INDUSTRY	TRI TOTAL Pounds	A/B/S* Percent	ORGANICS Percent	METALS Percent	HALO-ORGANICS Percent	NON-METALS Percent	MIXTURES Percent
20	Food	72,901,891	61.85	11.16	0.67	1.53	24.47	0.32
21	Tobacco	15,058,947	4.71	81.17	0.20	5.79	8.12	0.00
22	Textile	59,325,071	17.83	60.82	0.47	14.54	6.35	0.00
23	Apparel	1,919,695	13.58	62.84	1.60	20.92	0.01	1.05
24	Lumber	33,368,043	3.62	86.93	0.86	3.23	2.16	3.21
25	Furniture	62,795,289	0.57	93.47	0.45	5.13	0.02	0.36
26	Paper	370,343,051	28.13	55.10	0.64	6.36	9.76	0.00
27	Printing	60,541,926	5.40	83.94	3.48	6.97	0.17	0.05
28	Chemicals	2,883,479,294	53.83	30.90	2.46	3.89	8.86	0.00
29	Petroleum	104,236,707	6.37	57.08	3.64	0.38	32.53	0.00
30	Plastics	189,126,061	2.35	69.11	4.02	23.19	1.31	0.02
31	Leather	37,806,234	45.43	38.13	4.36	1.93	10.14	0.00
32	Stone/Clay	55,182,710	21.27	27.88	13.06	6.61	19.18	12.00
33	Primary Metals	857,866,507	18.97	5.89	55.31	3.34	16.00	0.49
34	Fab. Metals	215,112,500	24.08	38.30	14.66	22.24	0.65	0.07
35	Machinery	75,332,062	7.96	29.80	14.91	46.64	0.67	0.01
36	Electrical	182,384,794	13.44	36.64	8.71	39.61	1.59	0.00
37	Transportation	261,180,095	5.16	61.01	5.87	25.61	2.12	0.23
38	Measure./Photo.	64,367,648	5.04	42.04	2.02	50.46	0.44	0.00
39	Miscellaneous	36,043,356	1.76	61.06	3.86	31.88	0.77	0.67
	Mult. Codes 20-39	579,516,521	35.28	30.39	15.49	12.83	6.01	0.00
	No codes 20-39	23,142,344	28.68	37.52	8.87	17.30	7.62	0.00
	TOTAL	6,241,030,746						

* Acids/Bases/Salts

Note: Trade secrets accounted for less than 0.1% in all industrial categories.

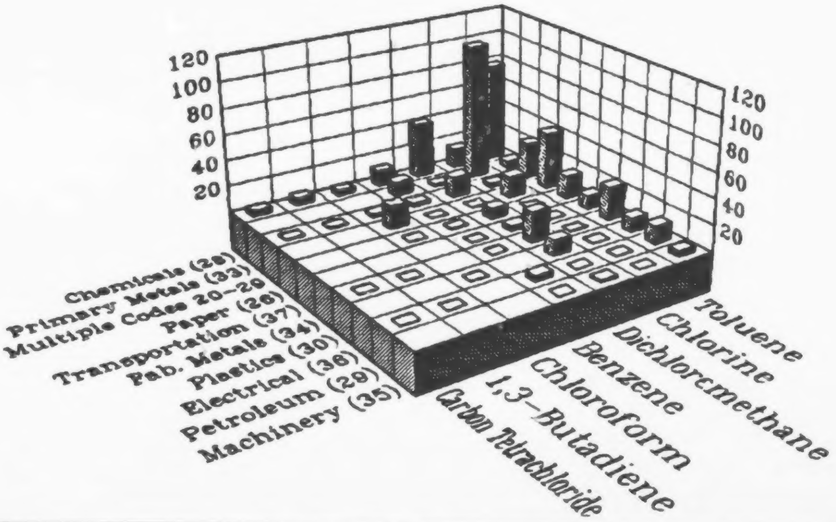

Figure 6-3. The 10 Industries with the Largest TRI Total Releases and Transfers and Selected Chemicals. (shown in millions of pounds).

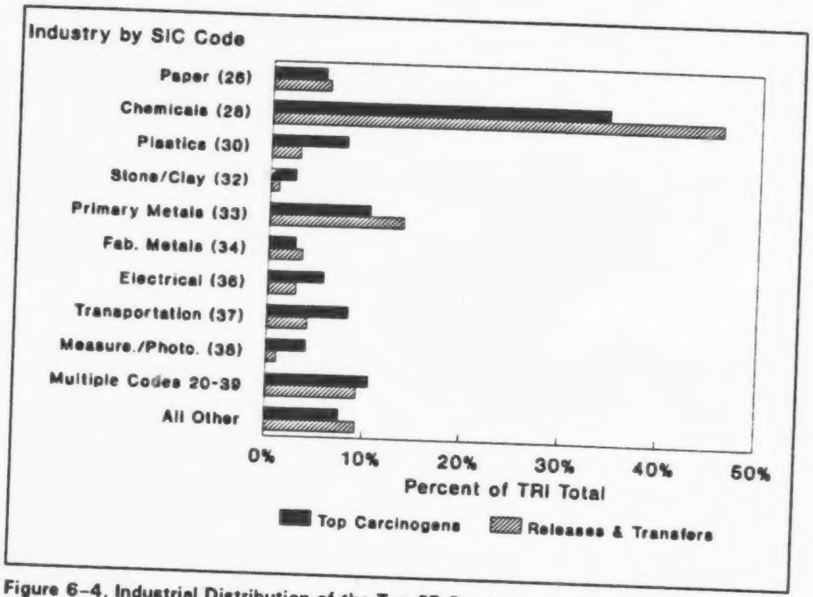

Figure 6-4. Industrial Distribution of the Top 25 Carcinogens Compared to TRI Total Release and Transfers, 1988.

Carcinogens

As described in Chapter 4, carcinogens made up seven percent of all TRI releases and transfers, and the 25 top carcinogens constituted 98 percent of the total releases and transfers for all TRI carcinogens. The following analysis of carcinogens is based on these 25 chemicals.

The Chemical industry generated the largest amounts of TRI carcinogens.

In keeping with the overall industrial distribution of total releases and transfers, the Chemical industry was responsible for the largest amount of TRI carcinogen releases and transfers. Chemical facilities reported over three times as many pounds of the top 25 carcinogens as any other industry, but this was a smaller share of carcinogens than its share of all TRI amounts (35 percent, compared to 46 percent for all TRI chemicals). Diversified facilities reporting Multiple SIC codes generated the next largest amount of carcinogens (47.0 million pounds), followed by Primary Metals (44.0 million pounds). This share of the top carcinogens for the diversified facilities slightly exceeded their share of total TRI chemicals (11 percent compared to nine percent); but the reverse is true for Primary Metals facilities, which generated ten percent of the top carcinogens, compared to 14 percent for total TRI chemicals. (See Figure 6–4 and Table D-7 in Appendix D.)

Industries reporting a disproportionate share of TRI's carcinogens, and in amounts exceeding ten million pounds, included the Rubber and Plastics industry, Stone/Clay/Glass Products, the Electrical/Electronic industry, the Transportation industry, and the Measuring/Photographic industry. Transportation, which ranked fourth in amount of carcinogens released, had twice as large a share of carcinogens as of total TRI chemicals (eight percent, compared to four percent). The Measuring/Photographic industry ranked eighth for carcinogens but only 12th overall; its share of carcinogens was four times its share of all TRI releases and transfers.

The Transportation industry ranked 4th in amount of carcinogens, with twice as large a share of carcinogens as of total TRI chemicals.

Many carcinogens were used and released primarily by the Chemical Products industry, which contributed over half the releases and transfers for 14 out of the top 25 carcinogens. The most extreme case was hexachlorobenzene: Chemical facilities contributed 100 percent of its total. Other carcinogens for which at least 75 percent of the total was released and transferred by the Chemical industry were acetonitrile, acrylonitrile, 1-3-butadiene, carbon tetrachloride, propylene oxide, vinyl chloride, 1-4-dichlorobenzene, and acrylamide.

The carcinogen hexachlorobenzene was released only by the Chemical industry.

The carcinogens released in greatest amounts were the most widely distributed among industries: no single industry contributed more than half of any of the top four carcinogens. The Chemical industry generated the largest proportion of dichloromethane releases and transfers (32 percent, 43.1 million pounds), but five other industries also reported sizable amounts (Rubber and Plastics; Multiple SIC codes; Measuring/Photographic; Electrical/Electronic; and Transportation). Benzene releases and transfers came primarily from the Chemical and Primary Metals industries (37 percent and 34 percent respectively), with only three other industry categories reporting over one million pounds (the Petroleum Refining, Multiple SIC codes, and Transportation industries). (See Figure 6–3.)

Dichloromethane releases and transfers were common in various industries.

The Measuring/Photographic industry had the largest proportion of carcinogens—30 percent of its TRI total was made up of carcinogens. Dichloromethane comprised 78 percent of this industry's carcinogens. The next highest share came from the Stone/Clay/Glass industry (22 percent), followed by Rubber and Plastic Products (19 percent). Only six percent of the TRI total reported by Chemical facilities were carcinogens, a smaller percentage than for 16 other industries. The Printing and Publishing industry had the lowest proportion of carcinogens (one percent), followed by the Food, Furniture, and Leather industries (two percent each). (See Table D–7 in Appendix D.)

The Measuring/Photographic and Stone/Clay/Glass industries reported the highest percentage of their TRI amounts as carcinogens.

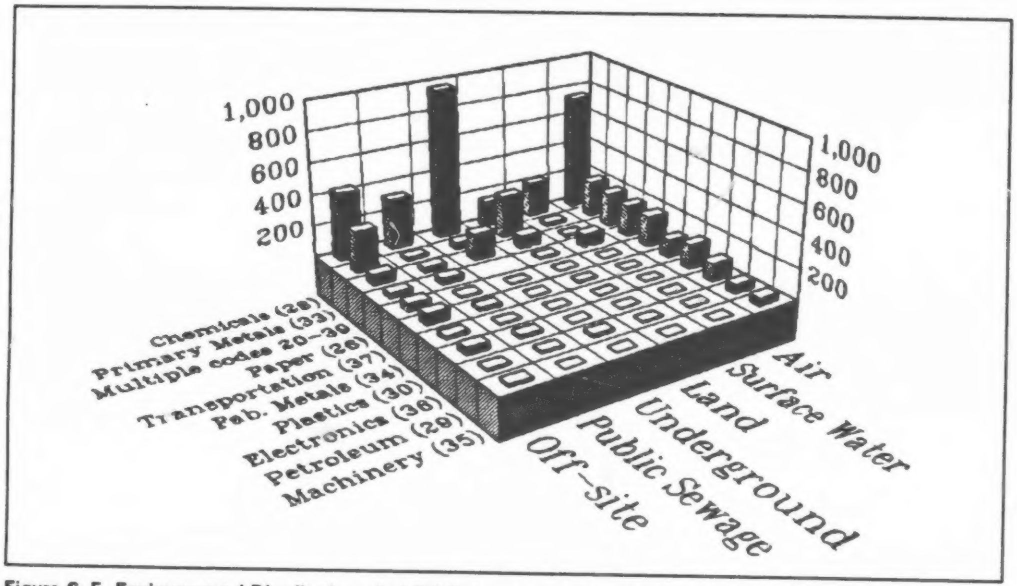

Figure 6-5. Environmental Distribution of of TRI Releases and Transfers from the Top 10 Industries, 1988.

ENVIRONMENTAL DISTRIBUTION OF RELEASES AND TRANSFERS BY INDUSTRY

Most industries released the largest share of their TRI totals directly to the environment.

The environmental distribution of TRI releases and transfers varied considerably by industry. Facilities in all but two industries released a greater total amount of chemicals directly into the air, water, land, or underground wells than they transferred off-site to other facilities, such as public sewage systems or incinerators, for treatment or disposal. (See Figure 6-5 and Table 3-4 in Chapter 3.)

Facilities in 2 industries—Leather and Food—shipped more off-site than they released directly to the environment.

Only the Leather Products industry and the Food Products industry reported a majority of their TRI amounts as transfers, as opposed to releases, in 1988. The Leather industry reported only 40 percent of its TRI total as releases; 54 percent went to public sewage treatment plants and six percent to other off-site facilities. Similarly, the Food industry released only 43 percent, transferring 54 percent to public sewage treatment plants and four percent to other off-site facilities. The next highest portions of transfers were those of the Apparel industry (45 percent), Fabricated Metals (42 percent), and Stone, Clay, and Glass Products (41 percent).

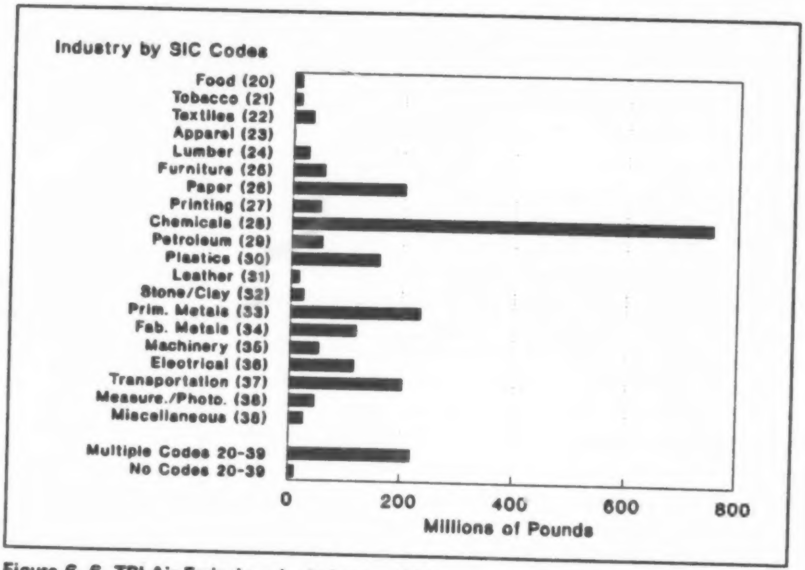

Figure 6-6. TRI Air Emissions by Industry, 1988.

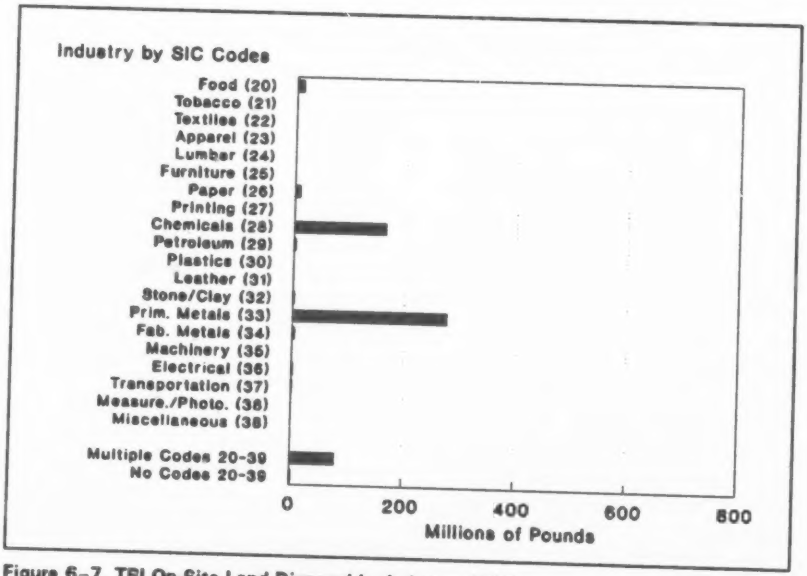

Figure 6-7. TRI On-Site Land Disposal by Industry, 1988.

Furniture manufacturers emitted 91% of their TRI total to air; Primary Metals facilities used on-site land disposal and off-site transfers for almost 2/3 of their total.

Some industries generated only certain types of TRI releases or transfers, while others reported significant portions in many categories. For example, Furniture manufacturers emitted 91 percent of their industry-wide total to air. The Primary Metals industry disposed of 32 percent of its total TRI amounts on land (on-site), and transferred another 31 percent to off-site facilities for treatment or disposal. On the other hand, Chemical facilities reported TRI chemicals across all sectors: 26 percent to air, eight percent to surface waters, six percent on-site to land, 34 percent to underground wells, 11 percent to public sewage, and 15 percent transferred to other off-site facilities.

Facilities in all but 4 industries emitted the largest share of their TRI totals to air.

A larger fraction of TRI totals were emitted to air than released or transferred in any other way, and all but four of the TRI industry groups emitted larger TRI amounts to air than any other environmental medium. Although air emissions represented only 27 percent of the Chemical industry's total releases and transfers, that industry still dominated in total pounds. Its 754.9 million pounds of air releases (31 percent of total air emission) were more than three times those of the Primary Metals industry or of facilities reporting Multiple SIC codes, the next two greatest contributors of air emissions. (See Figure 6-6.)

3 industries accounted for 93% of all on-site land disposal.

In contrast to the wide distribution of air emissions, land disposal from just three industrial groups accounted for the majority of on-site land disposal nationwide: Primary Metals (277.0 million pounds, or 49 percent of total on-site land releases), Chemical Products (164.6 million pounds, 29 percent), and facilities with Multiple Codes (80.3 million pounds, 14 percent). The Chemical industry, which was responsible for 46 percent of total TRI releases and transfers, accounted for 80 percent of all releases by underground injection and 63 percent of on-site discharges to surface water. (Compare Figures 6–6 and 6–7 on previous page.)

Comparison of 1987 and 1988

Despite some shifts within industries, the environmental distribution of TRI releases and transfers did not change significantly from 1987 to 1988.

The overall pattern of environmental distribution did not change dramatically between 1987 and 1988. Changes were more dramatic for individual industries, however. The most noticeable change was the relative decrease in off-site transfers by Petroleum Refiners, from 37 percent of their total TRI amounts in 1987 to only nine percent in 1988. This was accompanied by relative increases in the shares being released to air (from 37 percent in 1987 to 53 percent in 1988), and injected in on-site underground wells (from ten percent to 19 percent). The Electrical/Electronic industry also decreased the share of its TRI amounts being transferred off-site, from 34 percent to 25 percent. Primary Metals decreased the share of its TRI total being released on-site to land by ten percent (from 43 percent to 32 percent; a change of 129.5 million pounds).

THE INDUSTRIAL GEOGRAPHY OF TRI RELEASES AND TRANSFERS

While the Chemical industry played a major role across the board, different industries dominated in different states. Facilities in ten states contributed 56 percent of total releases and transfers, the top five of which contributed 38 percent (see Chapter 5). The same states dominated the releases and transfers of certain TRI industries. Louisiana and Texas, which alone contributed 23 percent of total TRI releases and transfers, also led the Chemical and Petroleum industries. Texas led both of those industries, with Louisiana second. Chemical and Petroleum facilities in these two Gulf States reported 1.1 billion pounds of releases and transfers, or 38 percent of all releases and transfers for those industries and 18 percent of the grand TRI total. In addition, Louisiana ranked first among the states for TRI releases and transfers from facilities reporting multiple SIC codes; and fifth in both the Textiles and Paper industries. Texas ranked among the top five in the Lumber, Fabricated Metals, and Machinery industries. (See Figure 6-8 and Table D-8 in Appendix D.)

TRI releases and transfers from the Chemical and Petroleum industries were concentrated in Louisiana and Texas.

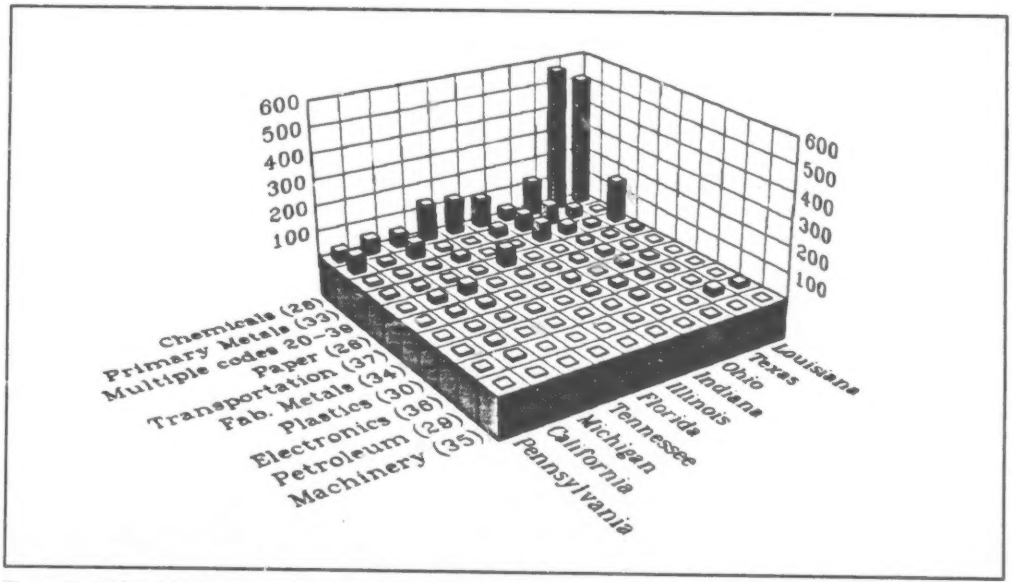

Figure 6-8. The 10 Industries with the Largest TRI Total Releases and Transfers (in Millions of Pounds) and Top 10 States. (States with the largest TRI total releases and transfers.)

Releases and transfers from many different industries were reported in Indiana, Ohio, California, Tennessee, and Pennsylvania.

Some top states had large TRI totals because of releases and transfers concentrated in one or two industries, while others had the top-ranked amounts for numerous industrial sectors. For example, Indiana appeared among the top five states in 11 of the 22 industrial categories and Ohio in ten of them. California, although only in ninth place in total releases and transfers (up from 11th place for 1987), led in the Food Products industry and was also in the top five in the Petroleum, Fabricated Metals, Machinery, Electrical/Electronic, Transportation, and Measuring/Photographic[3] industries. Seventh-place Tennessee and tenth-place Pennsylvania each placed in the top five in seven industries. (See Table 6-4.)

North Carolina had large releases and transfers from its Furniture and Textiles industries.

North Carolina is an example of a state with diversified sources of TRI releases and transfers, although it ranked only 17th in total TRI releases and transfers in 1988. It ranked first in the Furniture and Fixtures industry (with 18.3 million pounds, which was 11 percent of North Carolina's total) and in the Textile Mill Products industry (with 11.6 million pounds, or seven percent of the state total), and placed in the top five for two other industries (Tobacco and Rubber/Plastics). Its releases and transfers exceeded ten million pounds in four industrial categories and exceeded one million pounds in another nine.

15% of the nationwide TRI total for the Primary Metals industry came from Utah.

Utah, on the other hand, ranked 16th for total TRI releases and transfers, almost entirely as a result of its Primary Metals industry. The 126.4 million pounds of TRI releases and transfers from Primary Metals facilities in Utah were 15 percent of the national total for that industry and accounted for 92 percent of the state's TRI total. (These releases were in turn largely from one facility—Amax Magnesium in Tooele.)

Kansas ranked 3rd in the nation for Chemical industry releases and transfers.

The Chemical industry put Kansas in 13th place in total TRI releases and transfers, since 88 percent of the state total came from that industry (153.9 million pounds). Almost 60 percent of the Kansas total (92.0 million pounds) originated at Vulcan Chemicals in Wichita, the sixth highest facility in the nation for total TRI releases and transfers. Most of Vulcan's releases were on-site injection into underground wells, of hydrochloric and sulfuric acids. Another Wichita chemical facility, Racon Inc., ranked 15th in the nation in total TRI amounts for 1988 and second in TRI transfers. Off-site transfers of hydrochloric acid accounted for 99 percent of its 51.2 million TRI pounds. While Kansas ranked third in the Chemical industry, Kansas facilities reported one million pounds or more from only six other industries.

Geographic Concentration of Industrial Releases

The distribution of a given industry's releases and transfers—whether concentrated locally or scattered widely and evenly across the nation—may affect the

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(3) SIC Code 38 is defined as "Measuring, Analyzing, and Controlling Instruments; Photographic, Medical, and Optical Goods; Watches and Clocks."

Table 6-4. The 20 States with the Largest TRI Total Releases and Transfers by Industry Rank*, 1988.

SIC CODE	INDUSTRY	LA	TX	OH	IN	IL	FL	TN	MI	CA	PA	VA	MO	KS	NY	NJ	UT	NC	GA	KY	MS	OTHER STATES AMONG TOP 5 FOR INDUSTRY
20	Food	19	6	7	9	3	17	2	20	1	11	23	21	33	12	22	34	25	26	28	29	IA (4), WI (5
21	Tobacco	—	—	—	12	—	—	4	—	—	6	3	—	—	8	—	—	5	1	—	—	WV (2)
22	Textile	5	16	11	29	21	33	20	22	14	13	7	8	—	6	12	—	1	2	28	4	SC (3)
23	Apparel	—	—	1	16	4	—	2	7	9	6	—	—	15	5	—	—	11	3	18	12	
24	Lumber	24	4	10	1	18	33	20	12	7	5	6	41	27	34	36	23	13	21	40	14	MN (2), OR (3)
25	Furniture	36	16	12	5	11	15	4	3	8	6	2	21	—	10	29	33	1	18	28	14	
26	Paper	5	13	6	31	26	1	20	16	9	11	12	37	41	19	23	43	8	2	29	32	WA (3), WI (4)
27	Printing	37	22	12	2	1	23	4	25	21	5	3	16	19	8	17	—	9	15	14	7	
28	Chemicals	2	1	6	17	8	5	4	15	13	19	7	10	3	14	9	41	16	21	12	11	
29	Petroleum	2	1	5	9	7	42	30	22	3	4	18	33	6	21	12	19	38	35	16	14	
30	Plastics	47	16	3	1	4	28	7	8	6	13	9	12	27	18	20	42	5	19	23	14	SC (2)
31	Leather	—	6	18	14	8	27	17	3	20	5	—	1	—	15	7	30	11	—	22	—	ME (2), WI (4)
32	Stone/Clay	32	6	4	1	7	22	2	13	12	5	14	26	18	11	19	34	23	9	17	3	
33	Primary Metals	23	8	2	4	9	30	16	5	14	3	34	7	39	21	17	1	33	20	10	38	
34	Fab. Metals	32	5	1	10	3	15	21	2	4	7	16	13	34	11	8	38	14	18	26	19	WI (5)
35	Machinery	39	5	1	8	3	28	10	17	6	12	38	26	30	4	18	43	13	15	16	27	WI (2)
36	Electrical	40	11	5	3	8	17	24	26	4	7	20	10	29	6	25	27	14	22	13	31	MN (1), MA (2)
37	Transportation	25	8	3	5	9	7	10	1	2	14	21	4	30	13	24	16	20	12	18	33	
38	Measure./Photo.	—	18	15	22	11	8	23	40	3	7	30	24	36	1	5	10	17	19	—	31	MA (2), OK (4)
39	Miscellaneous	39	20	6	3	8	2	17	19	13	1	23	25	28	9	22	31	15	24	18	29	AZ (4), IA (5)
	Multiple codes 20-39	1	7	3	2	18	35	4	9	13	10	8	21	24	5	29	43	14	6	22	12	
	No codes 20-39	17	3	7	4	12	10	22	19	6	20	34	5	8	1	15	40	21	14	23	38	AL (2)
	TRI TOTAL RANK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

*No rank is given if there were no reported releases or transfers in a state for a given industry.

strategy for controlling or preventing future toxic releases. If most releases emanate from a few facilities in a few locations, to control releases at just a single facility could reduce releases for the entire industry. If, on the other hand, the TRI amounts originate in many facilities in diverse locations, methods that have industry-wide applications might better serve to prevent or control releases.

TRI totals from the Chemical Products and Primary Metals industries were distributed nationwide, with heavy concentrations in a few states.

The top two TRI industries, Chemical Products and Primary Metals, are each geographically spread out with many facilities reporting substantial releases in many states. However, Texas and Louisiana facilities together contributed 38 percent of the Chemical industry's TRI releases and transfers (with 574.0 million pounds and 519.5 million pounds, respectively), and seven other states reported more than 100 million pounds each. In the Primary Metals industry, only Utah contributed more than 100 million pounds, but numerous facilities in another 17 states reported more than ten million pounds in each state. (See Maps 6-1 and 6-2 and Table D-8 in Appendix D.)

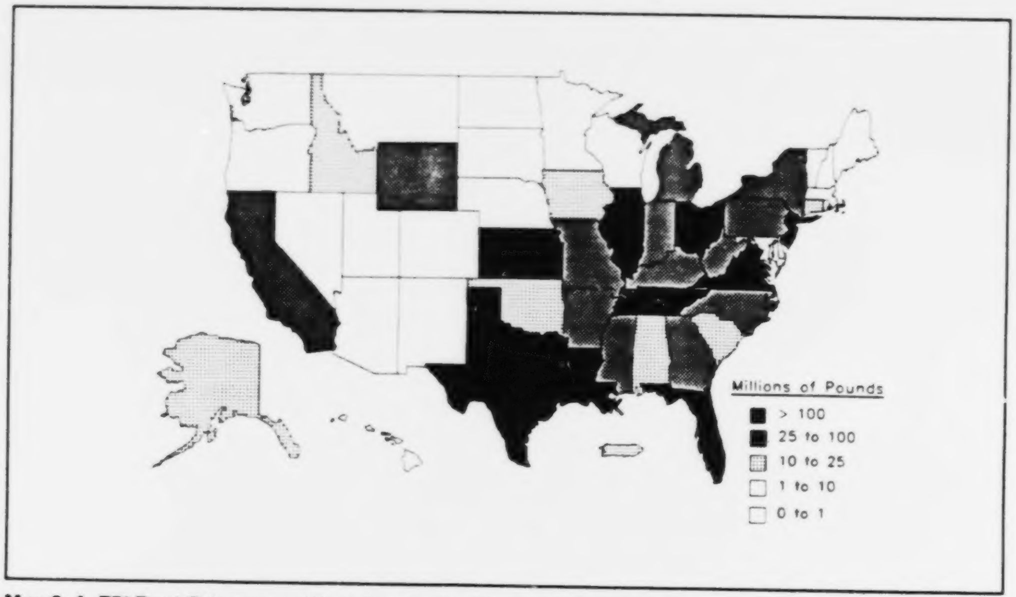
Petroleum industry releases were concentrated in just 3 states, while Transportation industry releases topped 1.0 million pounds in each of 34 states.

TRI data for the Petroleum and the Transportation industries show contrasting distributions. Releases and transfers in three states—Texas, Louisiana and California—accounted for 60 percent of the Petroleum industry's TRI total. Another 27 percent came from Midwestern facilities. In contrast, 1,005 facilities in 34 states reported more than one million pounds in each state of TRI releases and transfers from the Transportation Equipment industry; seven states had totals greater than ten million pounds. Because of the wide distribution of this industry, the top three states together only contributed 35 percent of the total despite their large releases (Michigan, 42.8 million pounds; California, 24.8 million; and Ohio, 23.4 million). (See Maps 6-3 and 6-4.)

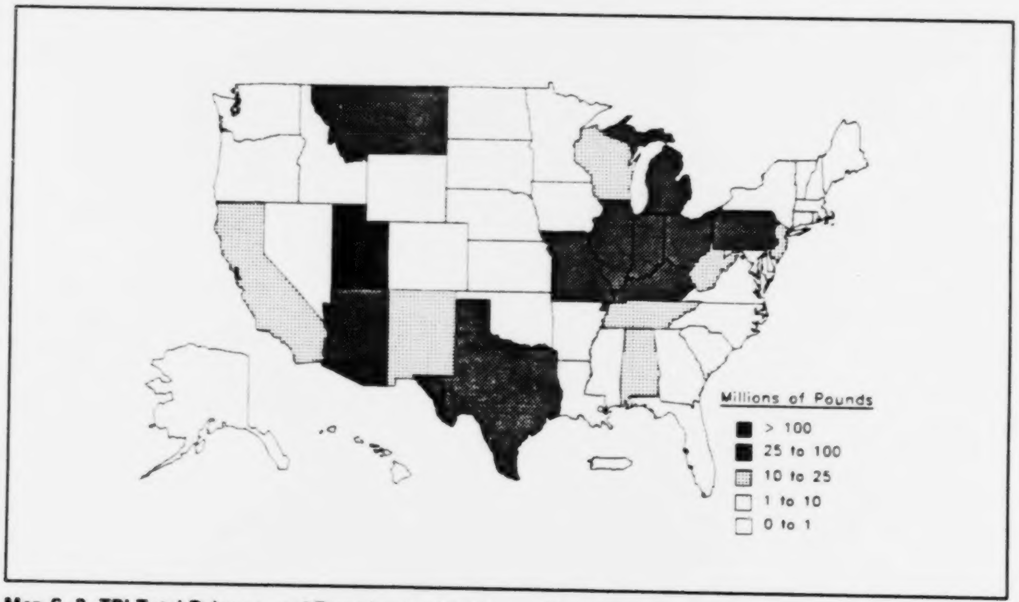
Diversified facilities had large releases and transfers in 13 states, including 169.4 million pounds in Louisiana and 74.4 million pounds in Indiana.

Facilities that reported multiple industrial categories constituted an important source of the releases and transfers of many states. These diversified facilities reported more than one million pounds of releases and transfers in each of 39 states, of which 13 exceeded ten million pounds, and one, Louisiana, reported 169.4 million pounds. In fact, diversified facilities in Louisiana contributed almost one-quarter of the total TRI releases and transfers in the state, and 30 percent of the national total for facilities reporting multiple SIC codes. Most of this (152.8 million pounds) came from the Shell Oil Company-Norco Manufacturing Complex, in Norco, which reported under both Chemical Products (SIC 28) and Petroleum Refining (SIC 29) and was the second highest facility in the nation for total TRI releases and transfers. Likewise, most of the Indiana amount of 74.4 million pounds came from a single facility: the Inland Steel Company in East Chicago, which reported 61.4 million pounds under both the Primary Metals and Stone/Clay/Glass industries, accounted for 82 percent of the state's total from diversified facilities and ranked tenth in the nation for total TRI releases and transfers.

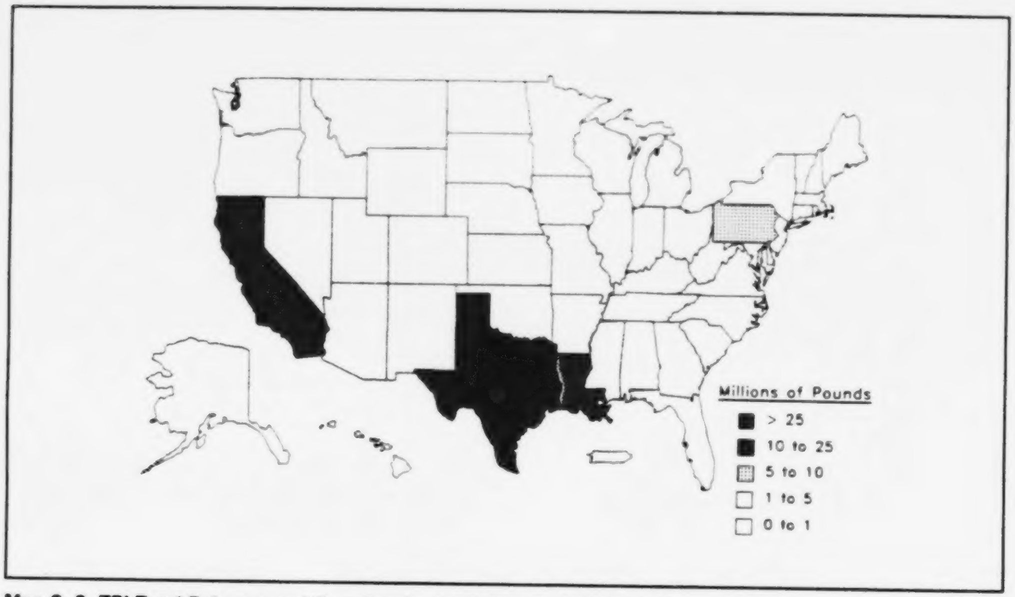
Box 6-E presents further observations about the geographical distribution of the TRI releases and transfers, by industry. The prominent role played by individual facilities in the state-wide patterns is discussed in more detail below.


Millions of Pounds
> 100
25 to 100
10 to 25
1 to 10
0 to 1

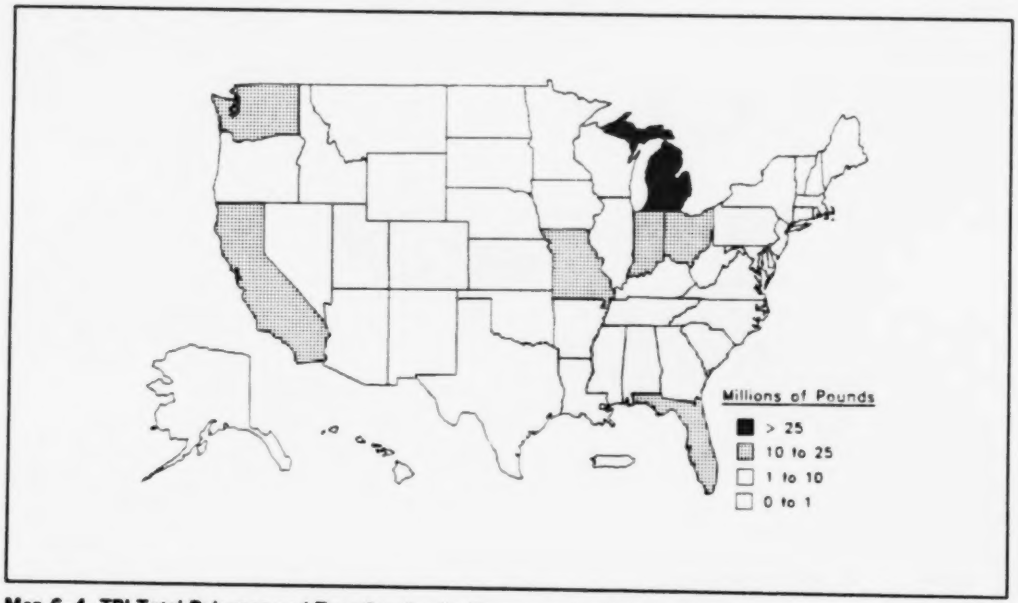
Map 6-1. TRI Total Releases and Transfers by the Chemical Industry, 1988.


Millions of Pounds
> 100
25 to 100
10 to 25
1 to 10
0 to 1

Map 6-2. TRI Total Releases and Transfers by the Primary Metals Industry, 1988.


Millions of Pounds
> 25
10 to 25
5 to 10
1 to 5
0 to 1

Map 6-3. TRI Total Releases and Transfers by the Petroleum Refining Industry, 1988.


Millions of Pounds
> 25
10 to 25
1 to 10
0 to 1

Map 6-4. TRI Total Releases and Transfers by the Transportation Industry, 1988.

BOX 6-E. ADDITIONAL GEOGRAPHICAL HIGHLIGHTS, 1988

Table 6-2 (in Appendix D) detail the geographic distribution patterns of TRI releases and transfers within each industry. What follows are highlights for TRI total releases and transfers of selected industries other than the top-ranked ones.

Food Products: California and Tennessee led in TRI releases and transfers. Their 23.3 million pounds accounted for more than one third of TRI amounts from this industry.

Textile Mill Products: The top two states (North Carolina, 11.6 million pounds; and Georgia, 9.8 million) accounted for 36 percent of this industry's TRI amounts.

Apparel: This industry reported relatively low TRI releases were concentrated in certain areas. Only 19 states reported any TRI amounts, and only seven of these reported more than 100,000 pounds each. Those seven (Ohio, Tennessee, Georgia, Illinois, New York, Pennsylvania, and Michigan) contributed 1.5 million pounds, or 79 percent of the total 1.9 million pounds for this industry.

Lumber and Wood Products: Indiana, with 3.8 million pounds, led the 13 states each contributing more than one million pounds of TRI releases and transfers. Not all leaders in this industry are those usually identified as "lumber" states: Oregon was indeed third, but Washington and Maine ranked only 11th and 13th.

Furniture and Fixtures: The two states that each contributed more than ten million pounds (North Carolina, 18.3 million; and Virginia, 10.7 million) together contributed 46 percent of the industry total of 62.8 million pounds.

Paper Products: This industry's TRI amounts were both widespread and concentrated. Fifteen states each contributed more than ten million pounds, but the top two each contributed more than 20 million (Florida, 73.5 million; and Georgia, 22.0 million). Together, their 95.5 million pounds represented 26 percent of the industry total of 370.3 million pounds.

Printing and Publishing: The top four TRI states each contributed more than five million pounds (Illinois, 14.7 million; Indiana, 7.1 million; Virginia, 5.4 million; and Tennessee, 5.1 million), which together equaled 52 percent of the industry's total 60.5 million pounds. Four of the top ten facilities in this industry were affiliated with R. R. Donnelley & Sons Company; together they represented one percent of the facilities and contributed 18 percent of the total releases and transfers from this industry.

Petroleum Refining: Facilities from the top three states together reported 60 percent of the total of 104.2 million pounds from this industry: Texas, 30.0 million; Louisiana, 21.0 million; and California, 11.5 million.

BOX 6-E (continued).

Rubber and Plastic Products: Perhaps the least geographically concentrated, this industry's TRI amounts came from diverse areas, with 31 states each contributing more than one million pounds and four of these each contributing more than ten million pounds. No single state stood out: TRI amounts from the top two states (Indiana and South Carolina) totaled 17.0 million pounds and 16.1 million pounds, or nine percent each of the industry total.

Leather Products: Facilities in Missouri, the leading TRI state for this industry, reported 12.0 million pounds of TRI releases and transfers—more than two and a half times that of the 4.7 million pounds each reported by manufacturers in the second-and third-ranked states, Maine and Michigan. In fact, a single Missouri facility, Blueside Company, Inc. in St. Joseph, was responsible for Missouri's prominence in this industry, by contributing 30 percent of the 37.8 million national total for this industry.

Stone/Clay/Glass Products: Three states accounted for 38 percent of the industry's 55.2 million pounds of TRI releases and transfers: Indiana, with 7.4 million, Tennessee, with 7.2 million, and Mississippi, with 6.6 million. The rest of the industry's TRI amounts were widely distributed, with nine other states each contributing more than one million pounds.

Fabricated Metals: The six states whose TRI facilities reported more than ten million pounds for each state collectively contributed 46 percent of the industry's 215.1 million-pound total. Ohio led, with 26.1 million pounds (12 percent of the industry total). Between one and ten million pounds came from each of another 25 states.

Machinery, except Electrical: Three states had TRI totals of more than five million pounds each. Together the three contributed 29 percent of the 75.3 million-pound industry total: Ohio, 8.9 million; Wyoming, 7.5 million; and Illinois, 5.8 million. Another 21 states had TRI totals of more than one million pounds each from this geographically dispersed industry.

Electric and Electronic Equipment: Of the 33 states from which manufacturers reported TRI totals of more than one million pounds, four showed more than 10 million. The combined total from Minnesota (21.9 million pounds), Massachusetts (15.3 million), Indiana (14.0 million), and California (11.9 million) represented 35 percent of the industry's 182.4 million pounds of total TRI releases and transfers.

Measuring, Photographic Goods: Facilities in New York state reported 29.9 million pounds, 47 percent of the total releases and transfers (64.4 million pounds) for this industrial category. New York's total was over five times that of second-ranked Massachusetts, which had 5.1 million pounds. The Eastman Kodak facility in Rochester (on Lake Avenue) that reported 21.8 million pounds was responsible for three-fourths of the New York industry total and over one third of the nationwide total for the industry. Two other New York facilities placed in the top ten facilities for the industry: Anitec Image Corporation in Binghamton (4.5 million pounds) and another Eastman Kodak facility in Rochester (the Elmgrove Plant, with 0.9 million pounds).

FACILITIES AND PARENT COMPANIES

Individual Facilities' Contributions to Industrial Totals

One way of comparing the disparate numbers of facilities and total releases across industries is to compute the *average release per facility* for each industry. The calculation suggests, for instance, that although facilities in the Food industry had large total releases and transfers, their average releases and transfers were smaller than those of any other industry. (See Table 6-1.)

Average statistics, however, tend to hide the fact that a few large individual facilities dominate several industrial sectors. Even in industries with a large number of facilities spread across the nation, a comparatively few of those with unusually large TRI releases and transfers can bring the numerical average well above the amount that is typical for most facilities across the industry.

All but 15 of the top 50 facilities in the nation for total TRI releases and transfers in 1988 were chemical facilities. Although these represented less than one percent of all chemical facilities, they contributed 56 percent of the Chemical industry's TRI releases and transfers and slightly over one quarter of the national TRI total. Three of the top five facilities were Chemical facilities in the Gulf states: American Cyanamid Company in Westwego, Louisiana, with 176.4 million pounds; Du Pont in Beaumont, Texas, with 111.9 million pounds; and Monsanto Company in Alvin, Texas, with 103.3 million pounds. The releases and transfers from *each* of these facilities alone exceeded the total releases and transfers of all facilities nationwide in each of 13 other industries. All three released more than 90 percent of their TRI chemicals to underground wells. Ammonium sulfate solution constituted 96 percent and 89 percent of the TRI chemicals of the Monsanto and Du Pont facilities and 36 percent at American Cyanamid, which also reported another 47 percent as sulfuric acid. (See Table 6-5 and Table 3-5 in Chapter 3.)

35 Chemical plants released 56% of that industry's TRI total and over 25% of the national TRI total.

The Primary Metals industry filled nine of the remaining 15 slots on the top 50 facilities for total TRI releases and transfers. Those facilities, which were less than one percent of that industry's facilities, accounted for 38 percent of the industry's TRI releases and transfers and five percent of the national TRI total. One of these, Amax Magnesium, in Tooele, Utah, ranked fourth in total TRI amounts and third in TRI *releases*, exceeding the TRI totals of all facilities in each of 14 other industries. Its releases were primarily air emissions of chlorine and hydrochloric acid.

Just 9 Primary Metals plants released 38% of the industry total and 5% of the TRI total.

The second-ranked facility was Shell Oil Company (Norco Manufacturing Complex) in Norco, Louisiana, a company reporting in SIC codes for both Chemical Products and Petroleum Refining, whose 158.7 million pounds exceeded total TRI amounts of all facilities in each of 14 industries, including

Table 6-5. The Facilities with the Largest TRI Total Releases and Transfers for Each Industry, 1988.

SIC CODE	INDUSTRY	TOTAL FACILITIES Number	TOTAL RELEASES AND TRANSFERS Pounds	TOP 10 FACILITIES RELEASES AND TRANSFERS Pounds	LARGEST FACILITIES	CITY	STATE	TRI RELEASES AND TRANSFERS Pounds
20	Food	1,452	72,901,891	31,388,712	DELANO GROWERS GRAPE PRODUCTS	DELANO	CA	9,618,700
					KRAFT FOOD INGREDIENT	MEMPHIS	TN	6,062,300
21	Tobacco	19	15,058,947	14,876,914	GEORGIA-PACIFIC CORP.	BRUNSWICK	GA	11,420,461
					ARISTECH CHEMICAL CORP.	KENOVA	WV	1,594,870
22	Textile	401	59,325,071	21,567,724	GENCORP POLYMER PRODUCTS	COLUMBUS	MS	5,648,672
					KING FINISHING CO.	DOVER	GA	3,459,954
23	Apparel	29	1,919,695	1,509,814	BUSTER BROWN APPAREL INC	CHATTANOOGA	TN	331,863
					CROWN CRAFTS INC.	CALHOUN	GA	257,243
24	Lumber	616	33,368,043	8,374,855	ANDERSEN CORP.	BAYPORT	MN	1,534,810
					AMERICAN WOODMARK CORP.	MOOREFIELD	WV	905,329
25	Furniture	397	62,795,289	10,012,501	STEELCASE INC.	GRAND RAPIDS	MI	2,169,326
					SINGER FURNITURE CO.	LENOIR	NC	1,185,150
26	Paper	587	370,343,051	118,299,771	ITT RAYONIER INC.	FERNANDINA BEACH	FL	54,369,100
					WESTVACO CORP.	LUKE	MD	9,107,754
27	Printing	313	60,541,926	25,918,808	MAXWELL COMMUNICATION	BROADVIEW	IL	4,281,006
					R.R. DONNELLEY & SONS CO.	WARSAW	IN	3,949,052
28	Chemicals	3,838	2,883,479,294	849,952,374	AMERICAN CYANAMID CO.	WESTWEGO	LA	176,418,250
					DU PONT BEAUMONT WORKS	BEAUMONT	TX	111,899,929
29	Petroleum	364	104,236,707	44,343,651	CITGO PETROLEUM CORP.	LAKE CHARLES	LA	11,153,343
					AMOCO OIL CO.	TEXAS CITY	TX	9,092,476
30	Plastics	1,293	189,126,061	36,992,923	WESTINGHOUSE ELECTRIC	HAMPTON	SC	9,328,292
					3M NEVADA PLANT	NEVADA	MO	3,933,312
31	Leather	132	37,806,234	26,479,959	BLUESIDE CO. INC.	SAINT JOSEPH	MO	11,377,169
					EAGLE OTTAWA LEATHER CO.	GRAND HAVEN	MI	3,740,757
32	Stone/Clay	559	55,182,710	28,376,252	COPLAY CEMENT CO.	LOGANSPORT	IN	6,534,320
					HARSHAW CHEMICAL CO.	JACKSON	MS	6,306,550
33	Primary Metals	1,380	857,866,507	337,324,941	AMAX MAGNESIUM	TOOELE	UT	107,750,090
					ASARCO INC.	HAYDEN	AZ	35,930,150
34	Fab. Metals	2,579	215,112,500	25,231,993	AJAX METAL PROCESSING	WARREN	MI	4,572,313
					PLATECO	REEDSBURG	WI	3,975,750
35	Machinery	870	75,332,062	13,897,753	LINCOLN ELECTRIC CO.	EUCLID	OH	3,657,194
					UNC NAVAL PRODUCTS	UNCASVILLE	CT	1,366,630
36	Electrical	1,578	182,384,794	40,031,627	3M MAG MEDIA & CONSUMER	HUTCHINSON	MN	16,645,979
					GENERAL ELECTRIC CO.	PITTSFIELD	MA	4,839,169
37	Transportation	1,054	261,180,095	28,368,620	GENERAL MOTORS	VAN NUYS	CA	3,651,260
					BOEING COMMERCIAL AIR.	EVERETT	WA	3,048,905
38	Measure./Photo.	344	64,367,648	39,673,657	EASTMAN KODAK CO.	ROCHESTER	NY	22,578,939
					ANITEC IMAGE CORP.	BINGHAMTON	NY	4,544,29
39	Miscellaneous	372	36,043,356	16,056,427	TRICIL RECOVERY SERVICES INC.	BARTOW	FL	3,668,250
					CONGOLEUM CORP.	MARCUS HOOK	PA	2,454,938
	Multiple codes 20 - 39	1,303	579,516,521	303,262,892	SHELL OIL CO.-NORCO MFG.	NORCO	LA	158,662,990
					INLAND STEEL CO.	EAST CHICAGO	IN	61,364,500
	No codes 20 - 39	282	23,142,344	12,657,775	OCCIDENTAL CHEMICAL CORP.	NIAGARA FALLS	NY	3,164,989
					GULF STATES STEEL INC.	GADSDEN	AL	2,416,710
			SUBTOTAL	2,034,599,943				909,973,042
			TOTAL FOR ALL OTHERS	4,206,430,803				5,331,330,704
			GRAND TOTAL	6,241,030,746				6,241,303,746

Box 3-C shows how corrections to the database affect releases from these facilities.

Petroleum Refining. Remaining facilities in the top 50 came from the Paper industry, Electrical/Electronics industry, Measuring/Photographic industry, and diversified facilities reporting Multiple SIC Codes. (See also Box 6–A.)

The important role of individual facilities is further shown by the fact that releases and transfers from the top facilities accounted for relatively large proportions of the totals for some industries. For example, an Eastman Kodak facility in Rochester, New York, contributed 35 percent of the TRI total for the Measuring and Photographic industry, and Blueside Company Inc. in St Joseph, Missouri, reported 11.4 million pounds, which was 30 percent of the Leather industry's total. Blueside transferred almost all of its TRI chemicals to public sewage, and these were mostly ammonium sulfate, sulfuric acid, and ammonia. The lowest percentage that any number one facility for a given industry reported of that industry's total releases and transfers was one percent, for the General Motors facility in Van Nuys, California, which lead the TRI totals for the Transportation industry. (See Table 6–5 and Box 6–C.)

A single Eastman Kodak plant in Rochester, New York, generated 1/3 of the total for the Measuring/Photographic industry.

The top ten facilities of five other industries[4] did account for more than half of the industry's releases and transfers, however: Apparel (79 percent), Leather (70 percent), Measuring/Photographic (62 percent), and Stone/Clay/Glass Products (51 percent), plus facilities reporting Multiple industrial categories (52 percent) and those reporting No Codes within the required range (55 percent). Although most of these industry groups are relatively small, and thus more likely to be dominated by the releases of their top facilities, the Multiple SIC Codes category is not. The top ten facilities in that group, accounting for 52 percent of total TRI amounts, constituted less than one percent of the 1,303 diversified facilities. In contrast, the top ten of the Transportation industry (one percent of its facilities) contributed 11 percent of that industry's total, and the top ten of the Furniture industry (three percent of its facilities) contributed 16 percent.

10 of 1,303 facilities in the multiple industrial category reported 1/2 the total pounds.

Parent Companies

A total of 338 facilities (fewer than two percent of all TRI facilities) operated by ten major companies, contributed 25 percent (1.6 billion pounds) of the 1988 TRI total. Du Pont, the top-ranked company, had 74 facilities that together generated TRI releases and transfers of 319.6 million pounds—five percent of the national total. Other top-ranked companies included Monsanto, American Cyanamid, Shell, and BP America. (See Table 6–6.)

Facilities operated by 10 parent companies contributed 25% of the TRI total for 1988.

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(4) The top ten facilities of the Tobacco industry (one-half of its facilities) appear to be responsible for 99 percent of the industry's total. However, when the SIC code of one plant is corrected (changed from the Tobacco industry to the Paper industry—see Box 3–C in Chapter 3) the proportion is less than one quarter.

Table 6-6. Parent Companies with the Largest TRI Total Releases and Transfers, 1988.

PARENT COMPANY NAME	FACILITIES		TOTAL RELEASES AND TRANSFERS		AVERAGE RELEASES AND TRANSFERS
	Number	Percent	Pounds	Percent	Pounds
DU PONT	74	0.37	319,570,681	5.12	4,318,523
MONSANTO CO.	37	0.19	201,858,822	3.23	5,455,644
AMERICAN CYANAMID CO.	27	0.14	188,986,177	3.03	6,999,488
SHELL CHEMICAL CO.	14	0.07	170,808,409	2.74	12,200,601
BP AMERICA INC.	18	0.09	151,255,881	2.42	8,403,105
FREEPORT MCMORAN INC.	7	0.04	150,465,176	2.41	21,495,025
AMAX INC.	11	0.06	112,897,662	1.81	10,263,424
ALLIED SIGNAL INC.	91	0.46	99,517,146	1.59	1,093,595
ASARCO INC.	11	0.06	98,162,489	1.57	8,923,863
OCCIDENTAL PETROLEUM CORP.	48	0.24	87,488,225	1.40	1,822,671
SUBTOTAL	338	1.71	1,581,010,668	25.33	4,677,546
TOTAL FOR FACILITIES INDICATING NO PARENT COMPANY	6,343	32.10	872,979,730	13.99	137,629
TOTAL FOR ALL OTHERS	13,081	66.19	3,787,040,348	60.68	289,507
GRAND TOTAL	19,762	100.00	6,241,030,746	100.00	315,810

Allied-Signal facilities generate average TRI totals of 1.1 million pounds per facility, while Freeport McMoran facilities generated an average of 21.5 million pounds.

The number of facilities reporting from the major parent companies ranged from seven (Freeport McMoran) to 91 (Allied Signal). As a consequence, the average releases and transfers per facility for these top companies varied considerably. Du Pont's 74 facilities, while generating the top-ranked TRI total, produced an average of 4.3 million pounds of releases and transfers per facility. In contrast, facilities operated by sixth-ranked Freeport McMoran generated an average of 21.5 million pounds per facility. Facilities owned by eighth-ranked Allied Signal contributed the lowest average per facility—1.1 million pounds.

Companies operating the most facilities did not necessarily generate the largest TRI totals.

The variation of total releases and transfers per facility within different companies is further shown by the fact that only two of the ten companies from which the most facilities reported to TRI were also among the top-ranked companies for TRI totals. A total of 135 General Motors facilities reported to TRI, generating a TRI total of 87.3 million pounds (an average of 647,000 pounds per facility)—which falls just below the top-ranked amounts. Borden's 74 facilities produced a TRI total of only 7.0 million pounds (an average of 94,000 pounds per facility), in contrast to the 319.6 million pounds produced by the 74 Du Pont facilities. Altogether, the ten companies with the most facilities reporting represented four percent of the TRI facilities and contributed ten percent of the TRI total. (See Table 6–7.)

Table 6-7. Parent Companies with the Largest Number of TRI Facilities, 1988.

PARENT COMPANY NAME	FACILITIES		TOTAL RELEASES AND TRANSFERS		AVERAGE RELEASES AND TRANSFERS
	Number	Percent	Pounds	Percent	Pounds
GENERAL MOTORS CORP.	135	0.68	87,328,338	1.40	646,877
GENERAL ELECTRIC CO.	122	0.62	43,223,992	0.69	354,295
ALLIED SIGNAL INC.	91	0.46	99,517,146	1.59	1,093,595
BORDEN INC.	74	0.37	6,957,425	0.11	94,019
DU PONT	74	0.37	319,570,681	5.12	4,318,523
WESTINGHOUSE ELECTRIC CORP.	72	0.37	16,366,501	0.26	227,313
PHILIP MORRIS CO. INC.	71	0.36	5,942,397	0.10	83,696
COOPER INDUSTRIES INC.	64	0.36	3,787,002	0.06	59,172
UNITED TECHNOLOGIES INC.	57	0.32	10,357,592	0.17	181,712
AMERICAN NATIONAL CAN CO.	56	0.29	13,424,454	0.22	239,722
SUBTOTAL	816	4.13	606,475,528	9.72	743,230
TOTAL FOR FACILITIES INDICATING NO PARENT COMPANY	6,343	32.10	872,979,730	13.99	137,629
TOTAL FOR ALL OTHERS	12,603	63.77	4,761,575,488	76.29	377,813
GRAND TOTAL	19,762	100.00	6,241,030,746	100.00	315,810

TOXIC RELEASES FROM NON-TRI SOURCES

TRI reporting does not include all sources of toxic chemicals. Manufacturers whose chemical use falls below the thresholds established by law, who have less than ten employees, or non-manufacturing operations are not currently included within the scope of TRI. EPA is, however, considering expanding TRI reporting to include certain non-manufacturing operations in the future. Federal facilities are not covered by the requirements, although some have volunteered to report. (Note, however, that private contractors operating Federal facilities *are* covered by the requirements.)

The intentional limits applied to TRI raises an obvious question: How much of the releases of any given toxic chemical are "captured" by the TRI reporting system? Some chemicals are used almost exclusively in large-scale chemical manufacturing operations, and thus have no sources of releases other than manufacturers. It is reasonable to suppose that releases and transfers of these chemicals—acrylonitrile is an example—are reasonably well-captured by TRI reporting. Other chemicals are widely used in non-manufacturing settings. Benzene and toluene, for instance, are both components of gasoline; automobile exhaust is a significant source of releases for these two chemicals that are not covered by TRI reporting.

The following two examples attempt to answer the question of "How much is covered by TRI for releases of chemicals" as a means of illustrating the role of TRI and non-TRI releases under a variety of chemical manufacture and use circumstances. The final section reviews the status of Federal facilities reporting to TRI.

Butadiene Air Emissions

Butadiene is a high-volume production chemical (3.0 billion pounds in 1989) used chiefly for the manufacture of several types of plastics and rubber. Its major use is as a component in tires, but it is also used in the manufacture of appliance housings, carpet backings, paper coatings, adhesives, plastic toys, footwear, construction items, and so on.

EPA's Office of Air Quality Planning and Standards (OAQPS) estimated that industrial *point source* air emissions of butadiene are 3.4 million pounds per year (estimates were based largely on 1984 data). This compares with TRI point source releases of 2.6 million in 1988 and 3.7 million pounds in 1987—a reasonably close agreement. OAQPS did not estimate fugitive emissions, but TRI data reveal them to be on generally the same scale.[5]

Industrial sources of butadiene emissions are only a small fraction of total nationwide butadiene emissions of 54.9 million pounds per year. More than 90 percent of butadiene emissions to the atmosphere stem from the mobile sources—cars, trucks, and buses. Although butadiene is not ordinarily present in gasoline in significant quantities, it is formed in internal combustion engines by the incomplete burning of fuel.

Although mobile source emissions of butadiene far outweigh sources reporting to TRI, this does not mean that industrial sources do not make a significant contribution, especially at a local level. Depending on a wide variety of conditions—population, weather patterns, the height of emission sources, frequency of releases—these and other industrial emissions of butadiene may add significant quantities of the chemical to that emitted by mobile sources.

Chloroform

TRI facilities reported releases of 23.9 million pounds of chloroform in 1988, 95 percent of which was due to air emissions. An additional 2.7 million pounds was transferred to off-site locations. Chloroform is used chiefly in industrial settings as a raw material and tends to be used in fairly large quantities, so that TRI can reasonably be assumed to capture most of the *primary* releases of chloroform. However, chloroform is also commonly formed as a byproduct of many chemical reactions when organic chemicals and chlorine (which are needed to chemically form chloroform) are present. Thus, there are many *secondary* sources of

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(5) *Locating and Estimating Air Emissions from Sources of 1,3-Butadiene*, EPA-450/2-89-021, December 1989.

chloroform releases, only some of which are reportable under TRI. Some of the possible sources of chloroform are summarized below.

The U.S. Public Health Service (USPHS) has estimated overall environmental releases of chloroform from anthropogenic sources.[6] Although the estimates are only preliminary, they provide a useful perspective on TRI data for this chemical. Overall releases of chloroform *from both TRI and non-TRI sources* are estimated at 23.0 million pounds, based largely on estimates made in 1982. Releases that originated from manufacturing facilities were estimated at 15.1 million pounds. The USPHS estimate is 63 percent of the quantity actually reported released by TRI facilities in 1988 (mostly from the Chemical and Paper industries). Even though the numbers for manufacturing releases are in the same ballpark, the TRI releases are considerably larger. Bear in mind, however, that the USPHS data are based largely on 1982 data, and were only meant as a rough estimation of the scale of chloroform releases from different sources. (See Table 6-8.)

Table 6-8. Sources of Chloroform Releases as Estimated by the U.S. Public Health Service (Based on 1982 Data).

SOURCE	AIR Pounds	SURFACE WATER Pounds	LAND DISPOSAL Pounds	TOTAL RELEASES AND TRANSFERS Pounds
MANUFACTURING SOURCES				
METHYL CHLORIDE/CHLORINE	431,200	17,600	11,880	460,680
HYPALON	120,780	TRACE	TRACE	120,780
CHLORODIFLUOROMETHANE	305,800	TRACE	4,400	310,200
METHANE CHLORINATION	154,440	7,260	TRACE	161,700
ETHYLENEDICHLORIDE	1,672,000	TRACE	477,400	2,149,400
PHARMACUETICALS	1,254,000	101,200	844,800	2,200,000
PULP AND PAPER	9,048,600	655,600	0	9,704,200
SUBTOTAL	12,986,820	781,660	1,338,480	15,106,960
NON-MANUFACTURING SOURCES				
TCI PHOTODEGRADATION	1,716,000	0	0	1,716,000
AUTO EXHAUST	396,000	0	0	396,000
MUNICIPAL WASTEWATER CHLORINATION	0	704,000	0	704,000
DRINKING WATER CHLORINATION	0	4,180,000	0	4,180,000
GRAIN FUMIGATION	62,480	0	0	62.480
SUBTOTAL	2,174,480	4,884,000	0	7,058,480
MISCELLANEOUS SOURCES				
COOLING WATER CHLORINATION	418,000	158,400	0	576,400
LOADING/TRANS LOSSES	198,220	0	0	198,220
PRODUCT CONTAMINATION	21.560	1,320	440	23,320
SUBTOTAL	637,780	159,720	440	797,940
TOTAL	15,799,080	5,825,380	1,338,920	22,963,380

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(6) *Toxicological Profile for Chloroform*, Agency for Toxic Substances and Disease Registry, ATSDR/TP-88/09, January 1989.

Manufacturing facilities account for most (66 percent) of the USPHS estimates for chloroform releases from all sources. There are also significant contributions from non-manufacturing activities: 4.2 million pounds are estimated to be formed during the chlorination of drinking water (along with another 0.7 million pounds from the chlorination of wastewater); the degradation of trichloroethylene in the atmosphere (which is itself released from both TRI and non-TRI sources) is a secondary source of chloroform estimated to contribute 1.7 million pounds of releases.

Unlike the TRI data, which is dominated by chloroform air emissions, the USPHS data contains a sizable quantity—5.8 million pounds or 25 percent of total releases—of releases to water that originate largely from water chlorination operations in non-manufacturing settings.

Federal Facilities

Facilities operated by the Federal government are not legally required to report under TRI, or under other provisions of the Emergency Planning and Community Right-to-Know Act (EPCRA). However, EPA has encouraged Federal agencies to voluntarily comply with EPCRA reporting requirements. EPA conducted a survey of EPCRA-related activities of Federal agencies, which included not only TRI activities, but emergency planning and local reporting provisions as well. Agency policies regarding TRI are summarized in Table 6-9. EPA has not yet received survey responses from the Department of Education and the Department of State on their EPCRA activities.[7]

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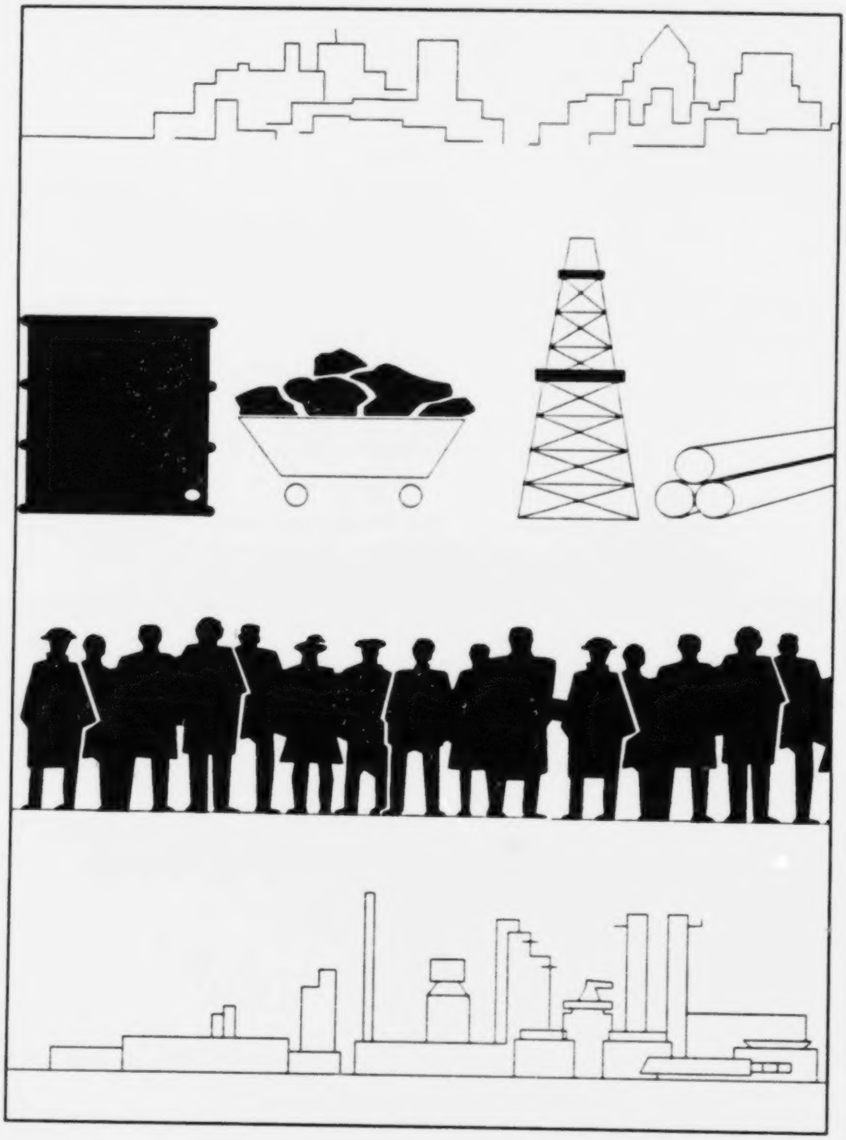
(7) *Summary of Federal Agency Title III Programs: Interim final Report* (EPA 130 9-90 001, February 1990).

Table 6-9. Federal Agencies that are conducting EPCRA Acticities, 1987 and 1988.

AGENCY	SUMMARY	NUMBER OF TRI FACILITIES
Dept. of Agriculture	No USDA facilities use TRI chemicals in excess of threshold amounts.	0
Central Intelligence Agency	No formal policy yet regarding TRI.	0
Defense: Dept. of the Air Force	Facilities are not required to report to TRI.	0
Defense: Dept. of the Army	Facilities are not required to report to TRI.	0
Defense Logistics Agency	DLA facilities are not within manufacturing SIC codes, and therefore do not report to TRI.	0
Defense: Dept. of the Navy	Facilities are not required to report to TRI.	0
Dept. of Energy	26 facilities use TRI chemicals in excess of the 10,000 pound threshold; 14 are planning to report to TRI, 8 are not within manufacturing SIC codes and will not report, 4 are of uncertain status. In addition, 4 facilities use TRI chemicals at below-threshold amounts will report.	18
Environmental Protection Agency	EPA policy is for facilities to comply if they meet reporting criteria. However, no EPA facilities are above the threshold.	0
General Services Administration	Policy regarding TRI is under development.	0
Dept. of Health and Human Services	DHHS facilites are being surveyed to determine if they should report to TRI.	0
Dept. of the Interior	DOI facilities are encouraged to voluntarily comply with TRI.	—
Dept. of Justice	No DOJ facilities are currently known to meet TRI requirements.	0
National Aeronautics and Space Administration	NASA has 7 facilities with TRI chemcials at above-threshold amounts, 3 of these are operated by private contractors and have submitted TRI reports.	3
National Science Foundation	No facilities meet TRI reporting requirements.	0
U.S. Postal Service	Facilities that meet TRI criteria are required to comply. However, USPS operations will meet TRI criteria.	—
Smithsonian Institution	No facilities meet TRI thresholds.	0
Tennessee Valley Authority	TVA policy is that all facilities meeting TRI criteria should report.	1
Dept. of Transportation	No DOT facilities meet TRI reporting criteria.	0
Dept. of the Treasury	Policy regarding TRI is in preparation.	—
Dept. of Veterans Affairs	Policy regarding TRI is in preparation.	—
	FEDERAL AGENCIES THAT HAVE DETERMINED THAT THEIR FACILITIES ARE NOT AFFECTED BY EPCRA REQUIREMENTS	
Department of Commerce		
Federal Emergency Management Authority		
Department of Housing and Urban Development		
National Archives and Records Adminstration		
Nuclear Regulatory Commission		



PART III

Changes in TRI Releases and Transfers

Photo: M,G&D Muir, Ltd.

CHAPTER 7. THE MATCHED DATA SET

The Toxics Release Inventory (TRI) data described in previous chapters disclose the overall increases and decreases in toxic chemical wastes from manufacturing facilities nationwide from 1987 to 1988. However, overall comparisons of TRI totals do not clearly reveal all changes in chemical use and releases for various reasons:

- Large changes at a few individual facilities mask thousands of other changes by other facilities.
- Changes in interpretation or estimation of releases may show apparent, rather than real, increases or decreases in the amounts of chemicals reported.
- Clarifications in the TRI reporting rule may also have led to reporting differences that represent apparent, rather than actual, changes.
- Changes in the TRI chemical list may have allowed some facilities that reported in 1987 to cease reporting in 1988 (if the delisted chemicals were the only ones used in threshold amounts).
- The TRI threshold reporting requirements were lowered between 1987 and 1988. The reduction of the reporting threshold from 75,000 to 50,000 pounds probably compelled more facilities to report in 1988 than in 1987.

(See Box 7-A.)

Approximately 20 percent of the facilities that reported to TRI in 1988 had not reported in 1987. Likewise, approximately 20 percent of the facilities that filed reports in 1987 did not file again in 1988. However, these facilities that reported in only one year accounted for a small fraction of the TRI releases and transfers in either year. TRI facilities that reported both years generated 96 percent of the total releases and transfers in 1987 and 1988. (See Table 7-1; see also Box 7-B for information on why a facility may have reported in one year only.)

Facilities that reported in both 1987 and 1988 generated 96% of the TRI totals in each year.

BOX 7-A.—INTERPRETING OVERALL CHANGES IN TRI TOTALS FROM 1987 TO 1988

Some changes in TRI releases and transfers may not represent actual changes in the amount of toxic chemicals manufactured, used, and released. Instead, changed totals may have arisen from changes in how facilities interpreted the requirements or estimated their totals. Any analysis of changes in the TRI totals should keep in mind the following possibilities.

- Facilities may have changed or refined their techniques for *estimating* their totals. That is, a facility that did not change the amount of a chemical manufactured or used from 1987 to 1988, but used a different method or equation to estimate its releases and transfers would report a different amount in 1988 than in 1987.
- TRI reporting instructions indicate that acid and bases that have been neutralized do not need to be reported. Some facilities that reported in 1987 may not have understood this provision, which would result in overstated releases and transfers of these chemicals in 1987.
- The 1987 instructions on how to report off-site transfers specified that *off-site locations* to which TRI chemicals were sent for recycling or reuse did not have to be reported; the form and instructions did not, however, clearly state that the *amounts* sent off-site for recycling and recovery did not need to be reported. The 1988 instructions did clearly state that facilities were "not required to report quantities of the chemical sent off-site for purposes of recycle or reuse" and also removed recycle/reuse from the list of codes for types of off-site treatment. Thus, some facilities may have reported amounts sent off-site for recycle or reuse in 1987 but not in 1988, leading to apparent reductions in the amount of TRI chemicals transferred off-site.
- Only facilities that are primarily manufacturing facilities, as defined in SIC codes 20 through 39 (Appendix B), were required to report to TRI. Facilities may have shifted most of their activities to an industrial sector other than manufacturing, or they may have determined that manufacturing was not their primary activity, so they either did not report to TRI in 1988 at all or reported smaller amounts.

A prime example of this last type of change is the reporting by Kennecott Utah Copper, a copper mining company that also manufactures some Primary Metals products (SIC Code 33). Kennecott reported disposing of nearly 130 million pounds of copper in 1987. After further examination of EPA guidance documents, however, the facility determined that its primary activity was mining, an industrial sector not covered by TRI reporting requirements. For 1988, then, Kennecott Copper reported only copper wastes generated by the *manufacturing* part of the plant—approximately four million pounds—rather than also from the *mining* areas. Thus, the 100-million-pound reduction of Kennecott's copper wastes, which was due to a reinterpretation of TRI regulations, represents a "paper" or accounting change rather than any actual change in waste generation or waste management.

Table 7-1. TRI Total Releases and Transfers for All Facilities, 1987 and 1988

	1988 TRI DATA				1987 TRI DATA			
	FACILITIES	FORMS	TOTAL RELEASES AND TRANSFERS		FACILITIES	FORMS	TOTAL RELEASES AND TRANSFERS	
	Number	Number	Pounds	Percent	Number	Number	Pounds	Percent
Facilities that reported in 1987 only or 1988 only (unmatched)	4,477	9,505	254,245,025	4.07	3,561	8,413	264,088,493	3.78
Facilities that reported in both 1987 and 1988 (matched)	15,285	61,626	5,986,785,721	95.93	15,285	58,344	6,713,344,049	96.22
Total Facilities	19,672	71,131	6,241,030,746	100.00	18,846	66,757	6,977,432,542	100.00

BOX 7-B.—FACILITIES THAT REPORTED TO TRI IN ONLY ONE YEAR

Reasons why a facility may have reported in 1987 only:

- The facility may have gone out of business. (The facility would still be required to report any amounts over the threshold for the time between January 1, 1988 and when it ceased operations.)
- The facility may have changed ownership and now reports under a different name.
- The facility may no longer meet TRI reporting requirements: a) it may no longer retain ten or more full-time employees; b) its industrial activities may have changed from a manufacturing (SIC Codes 20-39, shown in Appendix C) to a non-manufacturing sector; c) it may have not manufactured, processed, or used any TRI chemicals during 1988; or d) it did not manufacture, process, or use any of the TRI chemicals in quantities exceeding the reporting thresholds.
- The facility may have reported in 1987 when in fact it was not required to report and thus did not report in 1988.

Reasons why a facility may have reported in 1988 and not in 1987:

- The facility may be new—that is, it may have started operations after the 1987 reporting deadline.
- The facility may not have manufactured or processed TRI chemicals in amounts greater than the 1987 reporting threshold of 75,000 pounds, but did manufacture or process the chemicals in amounts exceeding the lower reporting threshold in effect for 1988 (50,000 pounds). (Note that the reporting threshold for other uses of TRI chemicals remained unchanged—10,000 pounds in each 1987 and 1988.)
- A facility that did not meet reporting requirements in 1987 may have grown or shifted into manufacturing activities so that it did meet TRI reporting requirements for 1988: a) the facility may have employed ten or more workers full-time in 1988 (but not 1987); b)the facility may have changed industrial activities from a non-manufacturing sector (industrial classifications outside SIC Codes 20-39, listed in Appendix C) to an industrial sector; or c) the facility started manufacturing, processing, or using one or more of the TRI chemicals in 1988 even though it did not in 1987.

BOX 7-C.—MATCHED DATA: A SAMPLE DATABASE

The rationale for creating subsets of the overall TRI data can be seen by examining a greatly simplified TRI data set consisting of only four chemicals and six facilities. Total releases and transfers for 1987 and 1988, summarized in Table 7-2, clearly detail the important differences between overall TRI totals, and the totals from the subsets of matched facilities and matched chemicals.

In the sample data set, six facilities reported all together, although only five reported for any given year, and only four reported in both years—these four are the *matched facilities*. There were a total of 11 chemical reports for 1987 and 11 for 1988. Eight of these were reported in both years from the matched facilities; these are the matched chemicals.

Overall, the total releases and transfers from these six facilities decreased 59 percent from 139.0 to 57.6 million pounds. Most of this decrease is due to the large release of 66.1 million pounds of phosphoric acid from Royster Phosphates, Inc. in 1987 that dropped to zero in 1988. Looking just at the matched facility data tells a similar overall story, although totals for the year are lower than the overall totals: releases from the four facilities that reported both 1987 and 1988 decreased by 60 percent (from 132.6 to 53.1 million pounds). The matched chemical totals are lower still (decreasing from 66.5 to 48.4 million pounds) and report a smaller decrease of only 27 percent.

Depending on the mix of facilities that do and do not report and the chemicals reported, total releases for individual chemicals can vary in different ways. The 1988 totals for sulfuric acid are identical for overall, matched facilities and matched chemicals data. In contrast, phosphoric acid totals are the same for matched facilities and matched chemicals, but not the overall data. Ammonium nitrate totals are the same for the overall and matched facilities, but much lower for matched chemicals.

The different data sets also affect the picture of change for individual chemicals. Copper compounds, for instance, decreased dramatically in 1988 (98 percent) if one considers data from *all facilities*, but actually increased by 44 percent if one examines the matched data. Similarly, ammonium nitrate releases and transfers increased from 1987 to 1988 from 2.4 to 6.4 million pounds; however, looking at the matched chemical data, ammonium nitrate releases and transfers decreased from 1987 to 1988 from 2.4 to 1.7 million pounds.

Analyzing TRI data three different ways admittedly creates a potential for confusion in a system already brimming with numerical results. There are solid reasons for pursuing these analyses, however.

OVERALL TRI DATA: This is the most readily accessible form of the data, and provides the most straightforward answer to questions such as: has the TRI data for a particular state, or for a particular chemical increased or decreased since last year? The overall data does not take into account the fact that facilities are entering the system for the first time or that facilities have dropped out; the results could mask trends in the data.

BOX 7-C, continued.

MATCHED FACILITIES DATA: This creates a set of facilities that have reported in all reporting years, thus filtering out the impacts of facilities which enter and leave the system for any number of reasons (some of which have little to do with actual changes in chemical handling or waste generating practices—see Boxes 7-A and 7-B). As TRI data accumulates over time, the matched facilities data (which will be facilitated by incorporating a standard facility identification number in TRI) will provide a clear picture of which areas, industries and environmental media are experiencing the largest changes in their levels of TRI releases and transfers.

MATCHED CHEMICALS DATA: This provides a "core" set of data of chemicals consistently reported by facilities that have also consistently reported. This documents changes in patterns of waste generation for an unchanging set of chemicals. This set of data avoids the complicating influence of chemical substitutions that do not genuinely reduce waste generation (for example, substituting one acid for another) but, by the same token, fails to include the impact of changes which have successfully eliminated use of TRI chemicals.

For the 1987–1988 data, the three data sets are not dramatically different from one another, and any one can be thought to provide a fairly representative picture of the changes taking place in the TRI data. As data accumulates over the course of several years, however, the availability of matched facilities and matched chemical data sets may reveal important distinctions that are masked by the full TRI data set.

Table 7-2. Sample TRI Data Set: Overall, Matched Facility, and Matched Chemical Data, 1987–1988. (Italics indicate matched facilities and bold indicates matched chemicals.)

FACILITY	1988 RELEASES AND TRANSFERS					1987 RELEASES AND TRANSFERS				
	PHOS-PHORIC ACID Pounds	AMMONIUM NITRATE Pounds	SULFURIC ACID Pounds	COPPER COM-POUNDS Pounds	TOTAL Pounds	PHOS-PHORIC ACID Pounds	AM-MONIUM NITRATE Pounds	SULFURIC ACID Pounds	COPPER COM-POUNDS Pounds	TOTAL Pounds
Arcadian Corp. (Geismar, LA)	**17,011,000**	**1,640,000**	**14,021,000**	—	**32,672,000**	**29,016,000**	**2,130,000**	**22,084,000**	—	**53,230,000**
Ciba-Geigy (Queenstown, NY)	—	**60,400**	**15,500,000**	**74,200**	**15,634,600**	—	**270,000**	**12,850,000**	**51,500**	**13,171,500**
Royster Co. (Mulberry, FL)	—	—	**17,000**	—	**17,000**	*66,141,000*	—	**27,000**	—	*66,168,000*
Du Pont (Beaumont, TX)	—	*4,720,022*	**31,210**	—	*4,751,232*	—	—	**43,200**	—	**43,200**
Royster Phoshates (Palmetto, FL)	4,500,000	—	22,000	—	4,522,000	—	—	—	—	—
Chino Mines (Hurley, NM)	—	—	—	—	—	—	—	519,400	5,882,059	6,401,459
Total Matched Chems	**17,011,000**	**1,700,400**	**29,569,210**	**74,200**	**48,354,810**	**29,016,000**	**2,400,000**	**35,004,200**	**51,500**	**66,471,700**
Total (Matched Facilities)	*17,011,000*	*6,420,422*	*29,569,210*	*74,200*	*53,074,832*	*95,157,000*	*2,400,000*	*35,004,200*	*51,500*	*132,612,700*
Total (All Facilities))	21,511,000	6,420,422	29,591,210	74,200	57,596,832	95,157,000	2,400,000	35,004,200	5,933,559	139,014,159

In order to take into account the effect of some of these year-to-year changes, Chapters 7 through 10 analyze two subsets of the overall TRI data. The matched facilities data set compares all data from all facilities that reported in both 1987 and 1988. The matched chemicals data set compares only those chemicals reported in both years by the matches facilities. The strengths of each data set are explained more fully in Box 7-C.

MATCHING TRI FACILITIES

Matched facilities are those that reported to TRI in both 1987 and 1988.

TRI forms did not require facilities to indicate whether they had also reported in 1987. Thus, to track changes at facilities that reported to TRI in both 1987 and 1988, EPA had to "match" facilities and forms by examining the facility name, street address, and zip code on all forms submitted to TRI. As shown in Figure 7-1 and further explained in Box 7-C, this analysis yields three groups of facilities:

- facilities that reported in 1987 only;
- facilities that reported in 1988 only; and
- facilities that reported in both 1987 and 1988 (**matched facilities**).

Matched chemicals are those reported in both 1987 and 1988 by matched facilities.

Chemical uses and releases reported by this last group (*matched facilities*) may have varied from one year to the next, according to production levels, types of chemical processes, and other changes. A facility that reported to TRI in both

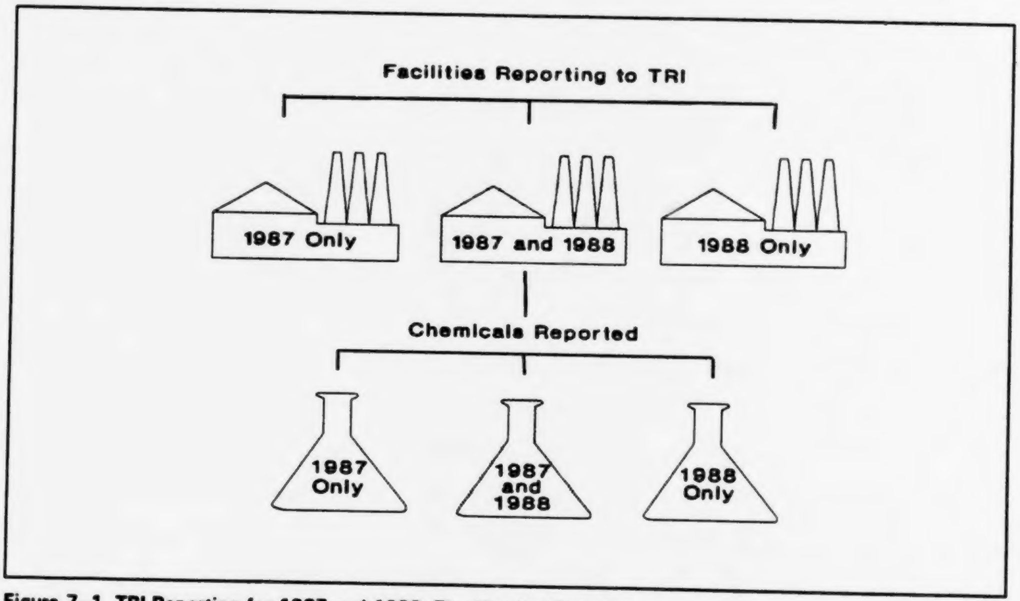


Figure 7-1. TRI Reporting for 1987 and 1988: The Matched Data Set.

1987 and 1988 may have reported different chemicals for the two years, which can be sorted into three groups:

- chemicals used or released in 1987 only;
- chemicals used or released in 1988 only; and
- chemicals used or released in both 1987 and 1988 (matched chemicals, also referred to as *chemicals reported both years*).

The rest of this chapter summarizes the comparison between data on matched chemicals, data on matched facilities, and the full set of data for 1987 and 1988. The following three chapters present more detailed comparisons of the data on matched chemicals only, noting significant shifts in the proportion of certain chemicals or industries or types of releases.

TOTAL RELEASES AND TRANSFERS REPORTED BY MATCHED FACILITIES

A total of 15,285 facilities of the 19,762 facilities (77 percent) that reported to TRI in 1988 also reported in 1987. These matched facilities, however, reported 96 percent of all TRI releases and transfers in both 1987 and 1988. They also submitted proportionately more forms (87 percent) in both years. (See Table 7-1.)

77% of TRI facilities reporting in 1987 and 1988 generated 96% of the TRI total.

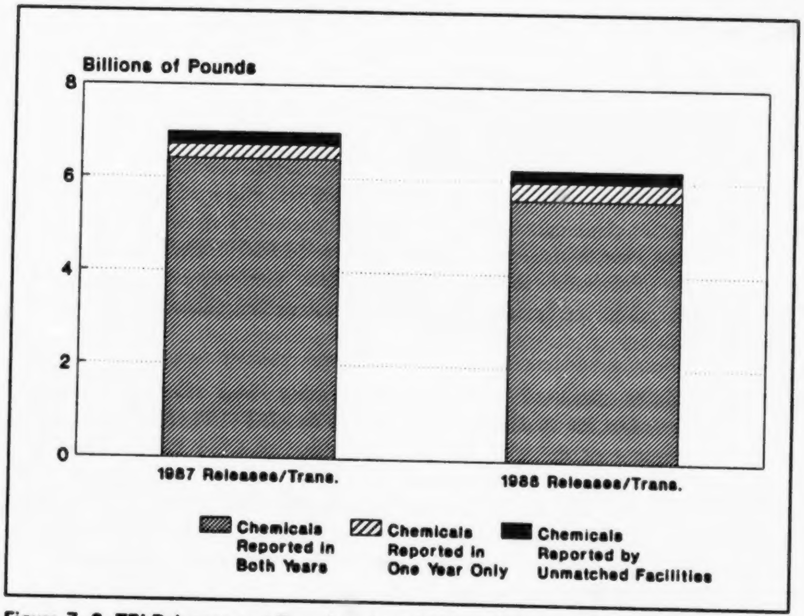


Figure 7-2. TRI Releases and Transfers for 1987 and 1988: The Matched Data Set. (Chemicals reported in both years or in one year only are for matched facilities.)

Table 7-3. TRI Releases and Transfers from Matched Facilities, 1987-1988.

	1988		1987		1987-1988 CHANGE			
	FORMS	RELEASES & TRANSFERS	FORMS	RELEASES & TRANSFERS	FORMS		RELEASES & TRANSFERS	
	Number	Pounds	Number	Pounds	Number	Percent	Pounds	Percent
Chemical Reported in Only One Year	11,634	384,769,859	7,932	294,176,891	3,702	46.67	90,592,968	30.80
Chemical Reported in Both Years*	49,992	5,602,015,862	50,412	6,419,167,158	-420	-0.83	-817,151,296	-12.73
Total For Matched Facilities	61,626	5,986,785,721	58,344	6,713,344,049	3,282	5.63	-726,558,328	-10.82

* The number of forms for matched chemicals was not always exactly the same in 1987 and 1988 because some facilities submitted more than one form per chemical in one year, but not the other.

Matched facilities reported more chemicals but decreased total release and transfers.

Matched facilities reported releases and transfers of more individual chemicals per facility, submitting 3,282 (six percent) more chemical-specific forms in 1988 than in 1987. However, these facilities decreased their TRI totals by 726.6 million pounds (6.7 to 6.0 billion pounds) or 11 percent. In other words, despite the fact that, on average, matched facilities reported more chemicals per facility (probably due in part to the decrease in the reporting threshold—see Chapter 1), the reductions in releases and transfers were large enough to offset the increase from the additional chemicals reported. (See Figure 7-2 and Table 7-3.)

Chemicals Reported Only in 1987 or Only in 1988

Matched facilities had a net gain in the number of chemicals reported, but a net decrease in total pounds of releases and transfers.

TRI matched facilities submitted 7,932 forms describing releases and transfers of 294.2 million pounds of *chemicals reported only in 1987* (14 percent of the forms and four percent of the TRI total for matched facilities). The fact that these chemicals were only reported in 1987 suggests that facilities managed to cut their *manufacture* of some chemicals by at least 25,000 pounds to avoid the lower reporting threshold (which dropped from 75,000 to 50,000 pounds) or they decreased their *use* of chemicals to below 10,000 pounds. Alternatively, they may have quit using or producing certain TRI chemicals altogether. (See Figure 7-2 and Table 7-3.)

TRI matched facilities submitted 11,634 forms describing 384.8 million pounds of releases and transfers for *chemicals reported only in 1988* (19 percent of the forms and six percent of the total releases and transfers from the matched facilities). That more chemicals were reported in 1988 than in 1987 suggests that some of these chemicals met the lower reporting threshold of 50,000 pounds. TRI totals of chemicals reported in 1988 only were 31 percent greater than those reported in 1987 only, the number of forms was 47 percent greater, indicating a smaller average release or transfer per form. Indeed, the average release or transfer per form for chemicals reported in 1987 only was 37,000 pounds, while the average per form for chemicals submitted in 1988 only was 33,000 pounds.

Matched Chemicals

Most of the TRI total for 1988 consisted of matched chemicals (those reported both years by matched facilities), 90 percent, or 5.6 out of 6.2 billion pounds of the 1988 totals reported by all TRI facilities. The matched chemicals also accounted for 70 percent (49,992) of the forms submitted in 1988 by all TRI facilities. That matched chemicals made up a larger share of total releases and transfers than of forms seems to indicate that these chemicals were in general reported in larger amounts per form than those chemicals reported only in 1988.

Matched chemicals reported by matched facilities made up over 90% of the TRI totals for 1988.

Facilities that reported on the same chemicals in both 1987 and 1988 reduced their releases and transfers of these chemicals overall from 6.4 billion pounds to 5.6 billion pounds, a decrease of 817.2 million pounds or 13 percent. These decreases may arise from either actual changes in industry practices from 1987 to 1988 or revised methods of calculating releases compared with those used in 1987. (See Figure 7-2 and Table 7-3.)

TRI totals for matched chemicals decreased by 13%.

The following sections show how the data on matched chemicals compares to the overall data on the environmental, chemical, geographical, and industrial distribution of TRI totals. The subsequent three chapters then focus exclusively on data on matched chemicals reported by matched facilities, examining the decreases and increases of each type of release.

ENVIRONMENTAL DISTRIBUTION

Most of the 1988 total underground injection was composed of matched chemicals—chemicals reported both years by matched facilities. The high proportion may reflect the specialized conditions needed for underground injection, as well as suggesting that when underground injection *is* used, large amounts of the same chemicals are generally disposed of in this manner. In contrast, 81 percent of the total on-site land disposal and 84 percent of the total off-site transfers consisted of matched chemicals; the lower proportions of matched chemicals indicate that the amounts or particular chemical composition of wastes diverted through these routes is more variable than that for underground injection. (See Table 7-4.)

The percentage of TRI release types consisting of matched chemicals ranged from 81% for on-site land disposal to 98% for underground injection.

CHEMICAL DISTRIBUTION

Matched chemical data makes up the largest share of TRI totals for all of the 25 chemicals released and transferred in the largest amounts in 1988. Ammonium sulfate, the top-ranked chemical for 1988, was generated almost entirely by matched facilities that reported it in both years—728.1 out of 745.5 million pounds of the total (98 percent) was matched chemical data. The statistics are similar for hydrochloric acid (98 percent), methanol (93 percent), sulfuric acid (92 percent), and most of the other top-ranked chemicals. In fact, for only five of the top 25 chemicals did totals for amounts reported only in 1987 or only in 1988 make up more than 20 percent of the overall data: copper compounds (44 percent was

Table 7-4. Environmental Distribution of TRI Releases and Transfers.

TYPE OF RELEASE OR TRANSFER	ALL FACILITIES				FACILITIES REPORTING ONE YEAR ONLY			
	1987 DATA		1988 DATA		1987 DATA		1988 DATA	
	Forms	Pounds	Forms	Pounds	Forms	Pounds	Forms	Pounds
Air Emissions	53,302	2,575,968,562	54,736	2,427,570,103	9,597	130,303,990	7,306	123,198,113
Surface Water Discharges	8,998	403,072,288	7,608	361,594,238	1,931	8,256,686	559	4,406,130
Land Disposal	5,384	730,895,340	3,922	561,556,882	1,386	15,997,785	344	24,455,708
Underground Injection	709	1,298,736,401	631	1,215,343,908	106	8,106,685	19	309,929
Transfers to Public Sewage	16,051	614,834,961	14,137	570,551,308	4,701	25,081,916	1,795	35,656,471
Off-site Transfers	28,588	1,353,924,990	27,190	1,104,414,307	5,602	76,341,431	3,385	66,218,674
Total Releases & Transfers	65,976	6,977,432,542	63,376	6,241,030,746	15,135	264,088,493	8,720	254,245,025

Table 7-5. The 25 Chemicals with the Largest TRI Total Releases and Transfers in 1988 Showing the Matched Data Set, 1987-1988.

CHEMICAL	ALL FACILITIES				FACILITIES REPORTING ONE YEAR ONLY			
	1987 DATA		1988 DATA		1987 DATA		1988 DATA	
	Forms	Pounds	Forms	Pounds	Forms	Pounds	Forms	Pounds
AMMONIUM SULFATE(a)	328	814,932,127	368	745,528,007	32	7,534,216	30	4,273,308
HYDROCHLORIC ACID	3,000	644,856,938	3,027	635,720,989	356	3,966,119	362	8,903,034
METHANOL(b)	2,128	435,550,127	2,334	435,639,693	228	9,804,501	257	6,695,153
SULFURIC ACID	5,112	478,195,883	5,347	386,060,541	536	13,482,318	634	25,911,138
AMMONIA	2,526	402,143,039	2,671	356,101,165	383	9,851,630	399	11,338,588
TOLUENE	3,340	362,178,333	3,553	333,315,437	490	24,160,863	561	24,075,873
ACETONE	2,225	252,961,335	2,455	249,703,395	323	18,459,067	407	17,107,931
PHOSPHORIC ACID	2,131	340,343,982	2,324	241,602,716	273	6,875,609	357	9,445,754
ZINC COMPOUNDS	1,182	193,484,430	1,474	209,127,626	123	2,818,673	236	5,317,554
XYLENE (MIXED ISOMERS)	2,905	224,213,405	3,067	181,771,506	404	18,237,887	449	11,926,156
1,1,1-TRICHLOROETHANE	3,267	189,130,017	3,481	180,418,488	503	18,209,592	608	18,634,483
METHYL ETHYL KETONE	2,218	197,310,127	2,242	156,490,232	312	12,752,900	327	10,104,160
CHLORINE	1,784	121,511,240	1,725	147,050,483	213	3,324,845	178	2,413,866
DICHLOROMETHANE	1,487	155,627,785	1,474	134,212,442	200	8,747,288	205	6,872,107
MANGANESE COMPOUNDS	356	57,269,705	434	114,926,157	43	551,211	74	228,138
AMMONIUM NITRATE	191	115,406,312	204	107,223,350	37	2,562,476	47	306,120
CARBON DISULFIDE(c)	86	136,423,873	87	82,748,299	5	4,020,222	6	1,312,913
NITRIC ACID	1,752	75,078,121	1,830	81,288,357	180	5,596,047	235	2,472,334
FREON 113	1,100	64,410,204	1,272	68,545,125	150	6,278,652	219	6,674,295
ZINC (FUME OR DUST)	611	97,538,784	581	66,013,145	96	2,306,193	95	1,242,779
GLYCOL ETHERS	1,138	58,622,937	1,450	62,255,269	105	3,303,357	181	3,851,855
ETHYLENE GLYCOL	1,244	50,002,667	1,379	55,713,223	148	1,905,195	170	1,532,288
COPPER COMPOUNDS	751	44,740,593	904	53,087,237	101	7,006,014	152	18,992,198
TRICHLOROETHYLENE	899	62,206,897	854	52,616,792	112	5,797,498	104	3,503,740
N-BUTYL ALCOHOL	930	48,018,185	1,035	52,004,930	100	3,579,054	111	2,464,228
SUBTOTAL	42,691	5,622,157,046	45,572	5,189,164,604	5,453	201,131,427	6,404	205,599,993
TOTAL FOR ALL OTHERS	24,066	1,355,275,496	25,559	1,051,866,142	2,960	62,957,066	3,101	48,645,032
GRAND TOTAL	66,757	6,977,432,542	71,131	6,241,030,746	8,413	264,088,493	9,505	254,245,025

(a) Corrections to the data add 51.4 million pounds to 1988 releases and transfers: (see Box 3-C).
(b) Corrections to the data add 7.9 million pounds to 1988 releases and transfers: (see Box 3-C).
(c) Corrections to the data add 42.9 million pounds to 1988 releases and transfers: (see Box 3-C).

Table 7-4, continued.

TYPE OF RELEASE OR TRANSFER	FACILITIES REPORTING BOTH YEARS							
	CHEMICALS REPORTED ONE YEAR ONLY				CHEMICALS REPORTED BOTH YEARS			
	1987 DATA		1988 DATA		1987 DATA		1988 DATA	
	Forms	Pounds	Forms	Pounds	Forms*	Pounds	Forms*	Pounds
Air Emissions	5,337	91,467,058	8,259	131,732,962	38,368	2,354,197,514	39,171	2,172,639,028
Surface Water Discharges	857	9,620,973	1,140	13,974,347	6,210	385,194,629	5,909	343,213,761
Land Disposal	581	73,945,354	634	84,583,962	3,417	640,952,201	2,944	452,517,212
Underground Injection	58	5,004,046	60	19,645,697	545	1,285,625,670	552	1,195,388,282
Transfers to Public Sewage	1,576	19,339,279	2,540	23,574,784	9,774	570,413,766	9,802	511,320,053
Off-site Transfers	3,417	94,800,181	4,753	111,258,107	19,569	1,182,783,378	19,052	926,937,526
Total Releases & Transfers	6,876	294,176,891	10,306	384,769,859	43,965	6,419,167,158	44,350	5,602,015,862

Table 7-5, continued

CHEMICAL	FACILITIES REPORTING BOTH YEARS							
	CHEMICALS REPORTED ONE YEAR ONLY				CHEMICALS REPORTED BOTH YEARS			
	1987 DATA		1988 DATA		1987 DATA		1988 DATA	
	Forms	Pounds	Forms	Pounds	Forms*	Pounds	Forms*	Pounds
AMMONIUM SULFATE(a)	27	4,259,931	70	13,112,388	269	803,137,980	268	728,142,311
HYDROCHLORIC ACID	265	5,041,719	299	5,737,880	2,379	635,849,100	2,366	621,080,075
METHANOL(b)	172	3,376,011	344	22,042,466	1,728	422,369,615	1,733	406,902,074
SULFURIC ACID	284	7,196,617	432	5,446,072	4,292	457,516,948	4,281	354,703,331
AMMONIA	203	8,786,018	343	11,229,244	1,940	383,505,391	1,929	333,533,333
TOLUENE	267	9,646,824	409	11,054,093	2,583	328,370,646	2,583	298,185,471
ACETONE	199	4,445,223	347	10,841,192	1,703	230,057,045	1,701	221,754,272
PHOSPHORIC ACID	198	2,380,140	308	2,894,942	1,660	331,088,233	1,659	229,262,020
ZINC COMPOUNDS	156	15,530,766	380	59,085,563	903	175,134,991	858	144,724,509
XYLENE (MIXED ISOMERS)	226	6,375,223	361	8,001,124	2,275	199,600,295	2,257	161,844,226
1,1,1-TRICHLOROETHANE	249	5,805,033	382	10,940,736	2,515	165,115,392	2,491	150,843,269
METHYL ETHYL KETONE	246	6,967,370	259	4,926,742	1,660	177,589,857	1,656	141,459,330
CHLORINE	146	1,868,413	129	1,018,126	1,425	116,317,982	1,418	143,618,491
DICHLOROMETHANE	227	15,081,657	212	4,854,523	1,060	131,798,840	1,057	122,485,812
MANGANESE COMPOUNDS	63	3,479,827	119	11,372,030	250	53,238,667	241	103,325,989
AMMONIUM NITRATE	19	1,349,295	24	5,462,354	135	111,494,541	133	101,454,876
CARBON DISULFIDE(c)	8	4,926	9	3,562,251	73	132,398,725	72	77,873,135
NITRIC ACID	174	1,217,616	196	13,479,603	1,398	68,264,458	1,399	65,336,420
FREON 113	66	2,622,378	176	5,519,936	884	55,509,174	877	56,350,894
ZINC (FUME OR DUST)	197	40,652,511	170	15,365,462	318	54,580.080	316	49,404,904
GLYCOL ETHERS	133	5.667,004	434	12,806,937	900	49,652,576	835	45,596,477
ETHYLENE GLYCOL	181	5,703,264	296	4,018,686	915	42,394,208	913	50,162,249
COPPER COMPOUNDS	154	5,941,513	273	4,534,254	496	31,793,066	479	29,560,785
TRICHLOROETHYLENE	107	4,045,678	73	3,246,689	680	52,363,721	677	45,866,363
N-BUTYL ALCOHOL	126	1,993,449	227	5,920,073	704	42,445,682	697	43,620,629
SUBTOTAL	4,093	169,438,406	6,272	256,473,366	33,145	5,251,587,213	32,896	4,727,091,245
TOTAL FOR ALL OTHERS	3,839	124,738,485	5,362	128,296,493	17,267	1,167,579,945	17,096	874,924,617
GRAND TOTAL	7,932	294,176,891	11,634	384,769,859	50,412	6,419,167,158	49,992	5,602,015,862

* The number of forms for chemicals reported both years was not always the same in both years because some facilities submitted more than one form per chemical in one year, but not the other.

reported in one year only); zinc (31 percent reported in one year only); glycol ethers (27 percent); zinc compounds (25 percent); and nitric acid (20 percent). The majority of TRI data represents chemicals that were reported by the same facilities in both 1987 and 1988. (See Table 7-5.)

Chemicals Reported Only in 1987

Zinc and zinc compounds were reported in large amounts in 1987, but not in 1988 . . .

Of the chemicals that were reported only in 1987 by matched facilities, 25 chemicals with the largest 1988 totals accounted for 58 percent of the 1987 total (169.4 out of 294.2 million pounds) in 1987. Many chemicals reported in large amounts *in 1987 only* were metals and metallic compounds: zinc (40.7 million pounds) and zinc compounds (15.5 million pounds).

TRI data alone do not indicate why large amounts of some chemicals were reported in 1987 but not 1988 because, if facilities no longer report on a chemical, no information need be submitted to indicate why. It may be that facilities reported some metals as *individual chemicals* in one year but as members of a *chemical category* in the other (see Box 4-D in Chapter 4). For example, 40.7 million pounds of zinc and 15.5 million pounds of zinc compounds were reported only in 1987, but 59.1 million pounds of zinc compounds and 15.4 million pounds of zinc were "newly" reported in 1988. If not reported in exactly the same way each year, amounts for zinc and for zinc compounds would not appear to correspond.

. . . as were the organic solvents, dichloromethane and toluene.

Several organic solvents, such as dichloromethane and toluene, were also among the chemicals with the largest releases and transfers reported only in 1987 by matched facilities. (Of course, many facilities continued to manufacture or use both chemicals and reported them again in 1988.) Total releases and transfers from matched facilities reporting these chemicals only in 1987 were 15.1 million pounds of dichloromethane and 9.6 million pounds of toluene. These facilities reduced the amount they manufactured or used of these chemicals below the reporting thresholds either through reductions or by ceasing their use or production altogether.

Chemicals Reported Only in 1988

Zinc compounds, methanol, and zinc were reported in relatively large amounts in 1988 by facilities that did not report them in 1987.

Of the chemicals reported by matched facilities *in 1988 only*, the 25 with the largest releases and transfers accounted for 67 percent (256.5 million pounds) of the 384.8 million pounds of the total. Among the chemicals reported in the largest amounts in 1988 only were zinc compounds (59.1 million pounds), methanol (22.0 million pounds), and zinc (15.4 million pounds). (Again, remember that other matched facilities manufactured and used these chemicals in 1987 as well.) The fact that these chemicals were first reported in 1988 by some facilities may be partly explained by changes in whether the metal was reported individually or as a member of a chemical category, as mentioned above. Alternatively, these changes may reflect new production or the lower threshold for reporting in 1988.

GEOGRAPHICAL DISTRIBUTION

The percentage of facilities in each state reporting in 1988 that also reported in 1987 (i.e. matched facilities) ranged from 70 to 85 percent (except for a few states and territories that had only a small number of TRI facilities where a small increase or decrease results in a large percentage change). (See Table 7–6.)

The percentage of matched facilities in each state ranged from 70 to 85%.

In most states, the matched facilities made up a majority of the facilities that reported to TRI and accounted for most of the releases and transfers in 1988. For example, in Montana, 99.9 percent of the releases and transfers in 1988 (35.4 million pounds out of 35.5 million pounds) were from matched facilities. For other states, newcomers to TRI played a more important role. In Wisconsin in 1987, for example, the matched facilities reported 92 percent of the totals but accounted for 77 percent in 1988. Facilities reporting for the first time in 1988 accounted for nearly one quarter of the releases and transfers in Wisconsin and any analysis of matched facilities for that state will have to recognize the greater influence of facilities reporting for the first time, possibly due to the lower reporting thresholds.

INDUSTRIAL DISTRIBUTION

Nearly the entire amount of TRI releases and transfers for the Chemical industry was generated by matched facilities and consisted of matched chemicals. The 96-percent share of matched chemicals suggests that the industry had a high proportion of facilities that generated amounts of TRI wastes sufficient to meet the higher threshold reporting requirements of 1987, and that they continued to generate the same chemicals in sizeable amounts in 1988. In contrast, the Apparel industry TRI total for 1988 was characterized by a significantly lower proportion of matched chemicals; almost 950,000 pounds for matched chemicals (49 percent) out of 1.9 million pounds for all chemicals from all facilities. This may indicate that the new lower reporting threshold required facilities to report more chemicals, or that facilities in the industry generated significant amounts of different chemicals in 1988 than in 1987. (See Table 7–7.)

Matched chemicals made up shares ranging from 49% of the Apparel industry TRI total for 1988 to 96% for the Chemical industry.

Shifts among Industry Categories

Approximately 13 percent of the forms (6,594) submitted by matched facilities on matched chemicals reported different industry categories in 1987 and 1988. These forms accounted for 571.5 million pounds of releases and transfers reported in 1988. Such shifts in industry category may be the result of a product change at the facility where the same chemical was used in both products, or may be a correction in the reporting of the industry category. These shifts changed the distribution of releases and transfers between industry categories. Of the 6,594 forms that reported different industry categories in 1987, 4,225 changed their two-digit SIC code (the category used in this report). These forms accounted for

13% of matched chemical forms listed a different industry in 1987 than 1988.

Table 7-6. TRI Total Releases and Transfers by State: The Matched Data Set, 1987-1988.

STATE	ALL FACILITIES						FACILITIES REPORTING ONE YEAR ONLY					
	1987 DATA			1988 DATA			1987 DATA			1988 DATA		
	Facilities	Forms	Pounds	Facilities	Forms	Pounds	Facilities	Forms	Pounds	Facilities	Forms	Pounds
Alabama	348	1,362	137,371,499	382	1,549	84,062,842	75	180	7,582,978	109	251	4,033,659
Alaska	7	56	[illegible]5,116,006	6	45	26,476,465	1	7	109	0	0	0
American Samoa	2	3	56,250	2	3	29,500	0	0	0	0	0	0
Arizona	151	492	73,393,460	166	534	74,657,306	27	43	1,253,114	42	59	900,395
Arkansas	287	884	80,819,715	304	988	72,272,458	49	119	3,089,409	66	139	2,686,166
California	1,649	5,224	227,163,400	1,655	5,350	201,568,789	377	879	13,542,696	383	770	13,895,610
Colorado	159	463	20,686,628	170	496	21,132,981	36	72	783,765	47	77	1,539,629
Connecticut	382	1,294	61,782,879	403	1,358	53,449,946	62	164	4,984,636	83	183	4,289,247
Delaware	50	217	16,380,748	56	223	10,692,005	11	25	2,724,846	17	35	544,077
D.C.	0	0	0	1	1	1,000	0	0	0	1	1	1,000
Florida	407	1,[illegible]3	303,881,804	467	1,307	249,655,746	86	173	2,784,286	146	277	14,981,843
Georgia	600	1,[illegible]2	144,617,832	598	1,984	131,410,860	133	303	15,297,001	131	244	5,901,159
Hawaii	27	95	3,251,517	24	86	2,964,331	7	11	89,879	4	7	11,046
Idaho	43	133	17,295,379	44	146	15,105,613	8	10	181,759	13	21	99,075
Illinois	1,167	3,928	266,457,734	1,229	4,375	251,302,153	162	350	7,797,397	224	496	10,860,070
Indiana	699	2,537	256,812,797	756	2,853	276,346,921	116	272	10,455,605	173	436	12,943,862
Iowa	305	934	53,410,874	331	1,025	58,668,674	50	92	1,377,884	76	134	1,726,488
Kansas	185	683	134,864,113	186	712	174,468,243	35	100	3,663,048	36	90	2,086,453
Kentucky	283	1,215	120,587,051	298	1,303	131,319,642	41	120	7,923,026	56	179	4,717,766
Louisiana	254	1,614	844,168,455	286	1,833	741,206,814	34	72	1,277,481	66	168	7,196,783
Maine	89	327	20,014,629	98	351	21,965,123	17	40	316,412	26	50	998,556
Maryland	189	652	43,296,676	195	713	33,340,174	47	99	1,816,633	53	115	2,253,428
Massachusetts	557	1,657	72,617,029	587	1,746	70,821,565	93	187	3,426,120	123	236	3,329,233
Michigan	763	3,104	268,882,144	790	3,249	231,681,301	144	357	21,847,185	171	384	22,550,011
Minnesota	303	1,060	63,726,041	330	1,081	65,506,519	50	117	2,938,528	77	133	3,143,530
Mississippi	237	801	164,281,523	248	843	120,820,916	49	112	3,027,923	60	113	3,789,206
Missouri	481	1,727	194,188,867	495	1,810	184,627,555	89	239	8,253,878	103	250	5,040,633
Montana	25	128	34,470,134	24	121	35,467,330	5	19	105,750	4	5	38,000
Nebraska	133	387	19,464,420	134	387	22,649,337	32	82	4,569,325	33	64	1,488,129
Nevada	38	84	2,288,293	34	93	4,874,292	8	17	1,341,678	4	12	488,452
New Hampshire	134	402	19,145,059	137	366	15,171,504	27	57	1,684,786	30	59	1,400,324
New Jersey	857	2,986	172,675,162	824	2,845	162,741,774	187	495	8,146,720	154	321	4,841,670
New Mexico	34	112	21,766,436	34	129	24,398,821	6	15	7,392,690	6	13	38,925
New York	754	2,540	194,344,217	816	2,700	172,106,105	114	270	6,751,071	176	373	9,295,922
North Carolina	762	2,403	138,049,052	805	2,689	136,857,071	151	310	7,743,728	194	398	7,806,936
North Dakota	27	65	1,072,921	28	67	1,394,580	7	11	208,771	8	8	221,266
Ohio	1,264	4,712	411,114,056	1,360	5,054	375,989,294	206	615	16,300,196	302	654	18,585,444
Oklahoma	187	619	56,767,725	182	668	51,720,309	46	95	6,405,861	41	88	1,725,821
Oregon	190	603	36,115,002	194	662	33,604,243	34	58	630,312	38	79	1,254,822
Pennsylvania	987	3,640	228,145,364	1,030	3,862	201,102,129	191	461	13,379,680	234	525	14,043,855
Puerto Rico	156	508	23,742,284	171	530	28,842,935	42	91	1,007,107	57	110	3,101,064
Rhode Island	176	467	13,692,203	188	517	12,568,955	36	71	2,479,164	48	108	681,468
South Carolina	374	1,454	85,655,766	375	1,488	82,177,534	88	224	5,574,738	89	210	3,960,695
South Dakota	34	69	3,093,401	41	71	3,059,629	6	11	333,425	13	15	216,702
Tennessee	486	1,663	293,726,678	517	1,736	249,417,227	97	245	9,612,205	128	280	8,221,752
Texas	994	4,873	883,532,803	1,089	5,264	724,477,706	181	511	29,898,257	276	603	10,360,686
Utah	99	364	252,944,126	111	416	137,472,389	17	47	960,523	29	72	609,646
Vermont	51	136	2,565,828	44	151	2,374,596	7	10	175,507	0	17	478,340
Virgin Islands	1	21	2,123,058	12	18	1,633,634	0	0	0	11	0	[illegible]
Virginia	385	1,301	216,151,241	405	1,425	196,619,903	70	145	2,749,973	90	216	7,218,533
Washington	294	934	41,533,699	305	950	50,338,221	54	95	1,434,708	65	96	3,833,420
West Virginia	104	603	66,618,005	101	606	57,901,379	21	51	1,862,263	18	50	820,286
Wisconsin	652	2,032	96,712,911	664	2,237	105,049,429	125	257	6,851,677	137	274	23,982,292
Wyoming	24	114	33,797,648	26	115	45,464,978	4	7	52,780	6	7	11,650
TOTAL	18,846	66,757	6,977,432,542	19,762	71,131	6,241,030,746	3,561	8,413	264,088,493	4,477	9,505	254,245,025

Table 7-6, continued.

STATE	FACILITIES REPORTING BOTH YEARS								
	FACILITIES	CHEMICALS REPORTED IN ONE YEAR ONLY				CHEMICALS REPORTED BOTH YEARS			
		1987 DATA		1988 DATA		1987 DATA		1988 DATA	
	Number	Forms*	Pounds	Forms	Pounds	Forms*	Pounds	Forms*	Pounds
Alabama	273	128	5,313,748	253	7,569,874	1,054	124,474,773	1,045	72,459,309
Alaska	6	3	22,000	6	2,317,923	46	36,093,897	39	24,158,542
American Samoa	2	0	0	0	0	3	56,250	3	29,500
Arizona	124	52	968,986	90	7,915,972	387	71,171,360	385	65,840,939
Arkansas	238	88	1,955,149	169	5,050,127	677	75,775,157	680	64,536,165
California	1,272	653	15,920,197	929	18,735,077	3,692	197,700,507	3,651	168,938,102
Colorado	123	51	1,049,100	79	858,031	340	18,853,763	340	18,735,321
Connecticut	320	150	2,127,851	209	3,956,161	980	54,670,392	966	45,204,538
Delaware	39	28	775,706	24	188,641	164	12,880,196	164	9,959,287
District of Columbia	0	0	0	0	0	0	0	0	0
Florida	321	119	3,123,479	185	6,765,035	861	297,974,039	845	227,908,868
Georgia	467	227	5,156,809	359	8,761,425	1,402	124,164,022	1,381	116,748,276
Hawaii	20	11	84,326	11	129,183	73	3,077,312	68	2,824,102
Idaho	35	19	7,644,769	22	302,698	104	9,468,851	103	14,703,840
Illinois	1,005	489	15,991,373	805	19,429,187	3,089	242,668,964	3,074	221,012,896
Indiana	583	296	16,515,445	494	26,381,565	1,969	229,841,747	1,923	237,021,494
Iowa	255	105	1,523,541	168	5,225,173	737	50,509,449	723	51,717,013
Kansas	150	63	402,243	100	1,860,860	520	130,798,822	522	170,520,930
Kentucky	242	156	3,936,828	192	3,750,490	939	108,727,197	932	122,851,386
Louisiana	220	159	8,183,261	237	7,453,140	1,383	834,707,713	1,428	726,556,891
Maine	72	31	877,145	51	2,361,031	256	18,821,072	250	18,605,536
Maryland	142	65	897,419	110	870,882	488	40,582,624	488	30,215,864
Massachusetts	464	216	5,733,867	272	6,079,651	1,254	63,457,042	1,238	61,412,681
Michigan	619	457	13,348,814	562	10,583,360	2,290	233,686,145	2,303	198,547,930
Minnesota	253	134	1,841,687	148	3,095,581	809	58,945,826	800	59,267,408
Mississippi	188	133	3,115,730	181	4,196,303	556	158,137,870	549	112,835,407
Missouri	392	229	44,266,697	318	32,581,682	1,259	141,668,292	1,242	147,005,240
Montana	20	6	73,066	13	2,145,505	103	34,291,318	103	33,283,825
Nebraska	101	37	447,863	57	752,917	268	14,447,232	266	20,408,291
Nevada	30	10	109,250	25	517,796	57	837,365	56	3,868,044
New Hampshire	107	85	1,217,671	46	846,125	260	16,242,602	261	12,925,055
New Jersey	670	342	5,671,458	410	6,968,880	2,149	158,856,984	2,114	150,931,224
New Mexico	28	11	113,192	29	12,251,566	86	14,260,554	87	12,108,330
New York	640	271	12,238,319	369	6,037,905	1,999	175,354,827	1,958	156,772,278
North Carolina	611	300	6,229,342	489	9,738,971	1,793	124,075,982	1,802	119,311,164
North Dakota	20	5	223,581	11	244,416	49	640,569	48	928,898
Ohio	1,058	576	16,197,576	912	32,805,432	3,521	378,616,284	3,488	324,598,418
Oklahoma	141	72	996,505	128	4,903,170	452	49,365,359	452	45,091,318
Oregon	156	81	4,497,907	124	4,395,660	464	30,986,783	459	27,953,761
Pennsylvania	796	470	20,207,773	670	19,557,544	2,709	194,557,911	2,667	167,500,730
Puerto Rico	114	55	596,234	80	1,114,646	362	22,138,943	340	24,627,225
Rhode Island	140	70	740,620	83	2,348,267	326	10,472,419	326	9,539,220
South Carolina	286	186	2,276,692	252	3,881,190	1,044	77,804,336	1,026	74,335,649
South Dakota	28	7	52,416	5	46,602	51	2,707,560	51	2,796,325
Tennessee	389	212	17,404,407	256	8,605,784	1,206	266,710,066	1,200	232,589,691
Texas	813	421	25,351,539	736	45,845,596	3,941	828,283,007	3,925	668,271,424
Utah	82	32	1,677,156	53	3,012,428	285	250,306,447	291	133,850,315
Vermont	44	13	382,559	22	160,565	113	2,007,762	112	1,735,691
Virgin Islands	1	2	1,200	0	0	19	2,121,858	18	1,633,634
Virginia	315	160	5,203,418	226	4,541,167	996	208,197,850	983	184,860,203
Washington	240	118	2,392,936	137	9,407,015	721	37,706,055	717	37,097,786
West Virginia	83	73	4,480,552	75	7,359,889	479	60,275,190	481	49,721,204
Wisconsin	527	241	4,392,031	436	10,749,890	1,534	85,469,203	1,527	70,317,247
Wyoming	20	14	225,458	16	111,881	93	33,519,410	92	45,341,447
TOTAL	15,285	7,932	294,176,891	11,634	384,769,859	50,412	6,419,167,158	49,992	5,602,015,862

* The number of forms for chemicals reported in both years was not always exactly the same in both years, probably because some facilities submitted more than one form per chemical in one year, but not the other.

Table 7-7. TRI Total Releases and Transfers by Industry: The Matched Data Set, 1987-1988.

SIC CODE	ALL FACILITIES						FACILITIES REPORTING ONE YEAR ONLY					
	1987 DATA			1988 DATA			1987 DATA			1988 DATA		
	Facilities	Forms	Pounds	Facilities	Forms	Pounds	Facilities	Forms	Pounds	Facilities	Forms	Pounds
Food (20)	1,274	2,390	67,048,081	1,452	2,648	72,810,091	288	469	8,037,921	459	671	12,320,607
Tobacco (21)	21	55	7,268,625	19	62	15,058,947	6	8	568,862	3	4	58,661
Textile (22)	386	817	68,613,808	401	889	59,243,571	97	150	5,698,720	111	191	8,024,544
Apparel (23)	26	47	2,650,724	29	49	1,919,695	9	13	325,791	13	16	725,467
Lumber (24)	599	1,665	32,099,975	616	1,721	33,981,003	134	312	3,770,944	137	276	4,177,129
Furniture (25)	366	1,369	61,245,023	397	1,555	62,774,758	86	207	6,946,917	116	350	10,582,220
Paper (26)	573	2,133	377,865,941	587	2,327	370,309,801	77	143	11,583,622	90	131	8,971,465
Printing(27)	290	567	63,380,815	313	623	60,541,926	66	102	4,478,567	92	142	7,039,561
Chemicals (28)	3,786	19,080	3,331,595,305	3,838	20,318	2,882,863,657	588	1,871	71,718,027	633	1,786	29,020,486
Petroleum (29)	333	2,922	181,573,172	364	3,048	104,348,924	65	191	8,937,669	89	204	3,646,061
Plastics (30)	1,188	2,836	190,945,529	1,293	3,212	189,009,353	262	523	20,339,133	357	648	16,911,774
Leather (31)	116	405	41,965,475	132	371	37,464,076	22	97	833,527	38	90	2,990,748
Stone/Clay (32)	516	1,380	57,615,356	559	1,316	55,264,210	98	242	10,353,961	149	257	3,339,288
Primary Metals (33)	1,327	5,164	947,918,364	1,380	5,439	856,630,711	203	509	22,711,432	246	614	43,565,169
Fab. Metals (34)	2,443	7,247	233,694,668	2,579	7,860	215,112,500	452	1,047	22,509,357	584	1,309	32,871,097
Machinery (35)	809	2,124	78,270,180	870	2,320	75,386,239	181	376	10,073,335	221	421	7,339,865
Electrical (36)	1,468	4,635	220,912,001	1,578	5,048	182,388,044	255	520	11,802,295	359	728	15,308,530
Transportation (37)	927	4,248	296,142,988	1,054	4,447	261,212,945	132	455	17,928,779	259	552	24,481,101
Measure/Photo (38)	320	978	78,145,426	344	1,000	64,367,648	62	112	2,897,897	81	150	3,145,954
Miscellaneous (39)	349	881	35,578,434	372	946	36,043,356	77	158	3,120,998	105	231	5,636,504
Multiple codes 20-39	1,336	4,659	579,543,188	1,303	5,135	580,675,921	219	473	15,152,625	222	522	9,483,382
No codes 20-39	393	1,155	23,359,464	282	797	23,623,370	182	435	4,298,114	113	212	4,605,412
TOTAL	18,846	66,757	6,977,432,542	19,762	71,131	6,241,030,746	3,561	8,413	264,088,493	4,477	9,505	254,245,025

461.0 million pounds (seven percent) of the total releases and transfers in 1987 and 403.4 million pounds (seven percent) of the matched total releases and transfers in 1988. (See Table 7-8.)

Many of the facilities with increases or decreases in releases and transfers greater than one million pounds *and* a SIC code change shifted between SIC codes 28, 33, 36, and the multiple category. For example, the Xidex Corporation located in Sunnyvale, California, reported under multiple industry categories (the Measuring/Photographic Goods—SIC 38—and the Machinery industry—SIC 35) in 1987 but reported only under a single industry code in 1988 (the Electric and Electronic industry—SIC 36). Thus, the 1.4 million pounds of releases and transfers the company reported in 1987 were reported under multiple categories in 1987 and the 217,324 pounds reported in 1988 were reported under only the Electric and Electronic industry in 1988. Conversely, the Automated Electro-Plating Co. in Newark, New Jersey, reported as a Chemical Products facility (SIC 28) in 1987 and as both a Chemical Products facility and a Fabricated Metals facility (SIC 34) in 1988. Thus, the reported 3.3 million pounds of releases and transfers in 1987 are tabulated under SIC code 28, while the 5.0 million pounds reported in 1988 from this facility are included in the multiple SIC code category.

Table 7-8. SIC Code Changes from 1987 to 1988 for Chemicals Reported in Both Years.

SIC CODE REPORTED, 1987 and 1988	FORMS		1987 RELEASES & TRANSFERS		1988 RELEASES & TRANSFERS	
	Number	Percent	Pounds	Percent	Pounds	Percent
4-digit same	42,745	86.64	5,723,739,781	89.17	5,030,496,967	89.80
2-digit same/4-digit different	2,369	4.80	234,407,043	3.65	168,104,274	3.00
2-digit different	4,225	8.56	461,020,334	7.18	403,414,321	7.20
TOTAL	49,339	100.00	6,419,167,158	100.00	5,602,015,562	100.00

Table 7-9. The 20 Facilities with the Greatest Decreases in Releases and Transfers for Chemicals Reported in 1987 and 1988.

FACILITY	CITY, COUNTY, STATE	1987 DATA			1988 DATA			1987-1988	
		CHEMICALS REPORTED 1987 ONLY	CHEMICALS REPORTED BOTH YEARS	TOTAL RELEASES & TRANSFERS	CHEMICALS REPORTED 1988 ONLY	CHEMICALS REPORTED BOTH YEARS	TOTAL RELEASES & TRANSFERS	DECREASE FOR MATCHED CHEMICALS	
		Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Percent
Kennecott Utah Copper (a)	Bingham Canyon, Salt Lake, UT	250	158,669,500	158,669,750	172,250	12,352,600	12,524,850	146,316,900	92.21
Royster Co.	Mulberry, Polk, FL	0	72,028,250	72,028,250	0	715,250	715,250	71,313,000	99.01
Monsanto Co. (b)	Alvin, Brazoria, TX	2,052,950	173,594,450	175,647,400	0	103,333,180	103,333,180	70,261,270	40.47
Interesin Corp.	Houston, Harris, TX	0	54,300,139	54,300,139	0	2,274	2,274	54,297,865	100.00
Occidental Chemical Corp.	White Springs, Hamilton, FL	0	92,240,300	92,240,300	0	50,342,021	50,342,021	41,898,279	45.42
Courtaulds Fibers Inc. (c)	Axis, Mobile, AL	0	43,139,315	43,139,315	0	1,244,655	1,244,655	41,894,660	97.11
American Cyanamid Co.	Westwego, Jefferson, LA	0	213,444,502	213,444,502	22,000	176,396,250	176,418,250	37,048,252	17.36
Amerada Hess Corp.	Purvis, Lamar, MS	0	35,906,600	35,906,600	750	1,191,950	1,192,700	34,714,650	96.68
Shell Oil Co. - Norco Mfg.	Norco, St. Charles, LA	1,097,305	193,136,650	194,233,955	28,350	158,634,640	158,662,990	34,502,010	17.86
Rexene Products	Odessa, Ector, TX	11,600	28,599,210	28,610,810	0	4,447,064	4,447,064	24,152,146	84.45
Arcadian Corp.	Geismar, Ascension, LA	0	56,447,250	56,447,250	0	35,655,500	35,655,500	20,791,750	36.83
Du Pont Johnsonville Plant	New Johnsonville, Humphreys, TN	0	72,474,201	72,474,201	500	52,691,410	52,691,910	19,782,791	27.30
W. R. Grace & Co.	Sulphur, Calcasieu, LA	0	21,974,323	21,974,323	57,000	5,006,700	5,063,700	16,967,623	77.22
Avtex Fibers Front Royal Inc.	Front Royal, Warren, VA	0	54,032,900	54,032,900	410,000	37,321,700	37,731,700	16,711,200	30.93
Lukens Steel Co.	Coatesville, Chester, PA	14,460	13,261,204	13,275,664	46,240	629,311	675,551	12,631,893	95.25
Monsanto Co.	Cahokia, St. Clair, IL	608,450	38,064,100	38,672,550	501,900	25,844,378	26,346,278	12,219,722	32.10
Air Products & Chemicals Inc.	Pasadena, Harris, TX	0	28,802,500	28,802,500	1,950	17,295,390	17,297,340	11,507,110	39.95
CIBA-GEIGY Corp.	Queensbury, Warren, NY	1,381,250	31,728,400	33,109,650	0	20,237,150	20,237,150	11,491,250	36.22
Eli Lilly & Co	Clinton, Vermillion, IN	124,500	15,811,200	15,935,700	0	4,341,800	4,341,800	11,469,400	72.54
Kerr-McGee Chemical Corp.	Trona, San Bernardino, CA	1,205,933	13,232,667	14,438,600	10,846	1,941,010	1,951,856	11,291,657	85.33
TOTAL		6,496,698	1,410,887,661	1,417,384,359	1,251,786	709,624,233	710,876,019	701,263,428	49.70

(a) Changes in accounting by the facility are responsible for most of this decrease (see Box 7-A).
(b) Corrections to the data change this facility's decrease to an increase of 55,497,990 (see Box 3-C).
(c) Corrections to the data change this facility's decrease to an increase of 1,005,340 (see Box 3-C).
Note: Data are shown for all chemicals reported by the facility, but the decrease is only calculated for chemicals reported in both years.

Table 7-7, continued.

INDUSTRY	FACILITIES REPORTING BOTH YEARS									
	FACILITIES		CHEMICALS REPORTED ONE YEAR ONLY				CHEMICALS REPORTED BOTH YEARS			
	1987(a)	1988(a)	1987 DATA		1988 DATA		1987 DATA		1988 DATA	
	Number	Number	Forms	Pounds	Forms	Pounds	Forms(b)	Pounds	Forms(b)	Pounds
Food (20)	986	993	209	2,492,040	267	3,581,747	1,712	56,518,120	1,710	56,907,737
Tobacco (21)	15	16	3	1,692	8	65,044	44	6,698,071	50	14,935,242
Textile (22)	289	290	107	5,019,867	148	3,984,914	560	57,895,221	550	47,234,113
Apparel (23)	17	16	5	74,964	7	246,897	29	2,249,969	26	947,331
Lumber (24)	465	479	265	2,822,202	335	4,707,425	1,088	25,506,829	1,110	25,096,449
Furniture (25)	280	281	169	3,576,346	230	5,628,726	993	50,721,760	975	46,563,812
Paper (26)	496	497	194	9,949,344	413	31,578,212	1,796	356,332,975	1,783	329,760,124
Printing (27)	224	221	71	3,613,960	100	3,237,891	394	55,288,288	381	50,264,474
Chemicals (28)	3,198	3,205	1,699	52,363,338	3,107	71,762,034	15,510	3,207,513,940	15,425	2,782,081,137
Petroleum (29)	268	275	289	7,705,144	403	3,287,669	2,442	164,930,359	2,441	97,415,194
Plastics (30)	926	936	301	9,983,675	528	12,724,915	2,012	160,622,721	2,036	159,372,664
Leather (31)	94	94	58	1,403,918	45	2,092,262	250	39,728,030	236	32,381,066
Stone/Clay (32)	418	410	232	3,215,438	189	9,905,774	906	44,045,957	870	42,019,148
Primary Metals (33)	1,124	1,134	756	85,922,741	1,009	121,082,650	3,899	839,284,191	3,816	691,982,892
Fab. Metals (34)	1,991	1,995	987	15,111,834	1,434	21,176,192	5,213	196,073,477	5,117	161,065,211
Machinery (35)	628	649	276	5,309,410	414	10,264,938	1,472	62,887,435	1,485	57,781,436
Electrical (36)	1,213	1,219	591	16,796,565	788	16,235,529	3,524	192,313,141	3,532	150,843,985
Transportation (37)	795	795	787	24,326,697	933	23,764,883	3,006	253,887,512	2,962	212,966,961
Measure./Photo .(38)	258	263	132	8,720,814	130	2,301,622	734	66,526,715	720	58,920,072
Miscellaneous (39)	272	267	124	2,634,105	142	2,854,432	599	29,823,331	573	27,552,420
Multiple codes 20-39	1,117	1,081	588	31,354,118	922	32,861,170	3,598	533,036,445	3,691	538,331,369
No codes 20-39	211	169	89	1,778,679	82	1,424,933	631	17,282,671	503	17,593,025
TOTAL	15,285	15,285	7,932	294,176,891	11,634	384,769,859	50,412	6,419,167,158	49,992	5,602,015,862

(a) The number of matched facilities per industry is not always the same for 1987 and 1988 because some facilities reported different SIC codes each year.
(b) The number of matched chemical forms was not always exactly the same in 1987 and 1988 because some facilities submitted more than one form per chemical in one year and not the other.

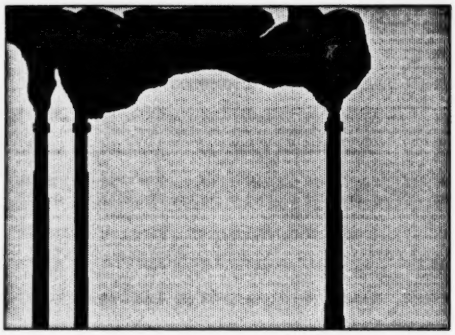
Overall, then, some increases or decreases appearing in a particular industrial category will be due to changes in how SIC codes were reported, but increases in one are balanced by decreases in another category. The overall impact is seven percent of the 1988 totals.

INDIVIDUAL FACILITIES

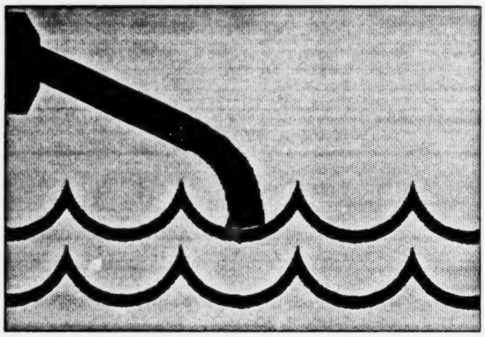
Many changes in releases and transfers can be traced to large changes at a few individual facilities and these changes significantly affect the overall pattern of releases and transfers for chemicals, states, industries, and environmental media. The 20 matched facilities reporting the largest decreases accounted for 710.9 million pounds of total releases and transfers in 1988, nearly all of which (99.8 percent) was for chemicals also used in 1987. The combined decreases of 701.3 million pounds from these 20 facilities is two and a half times greater than the total increases reported by the 20 matched facilities reporting the greatest increases. These facilities play a large role in explaining the distribution of changes reported by matched facilities in Chapters 8 through 10. (See Tables 7-9 and 7-10.)

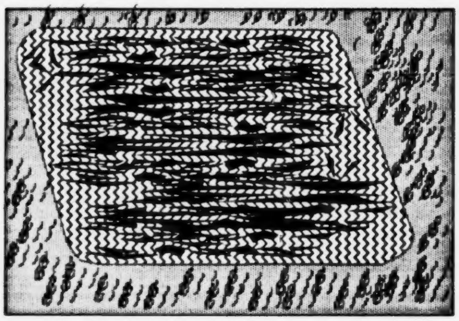
Large decreases by just 20 facilities significantly affect the general patterns shown in TRI data.

AIR

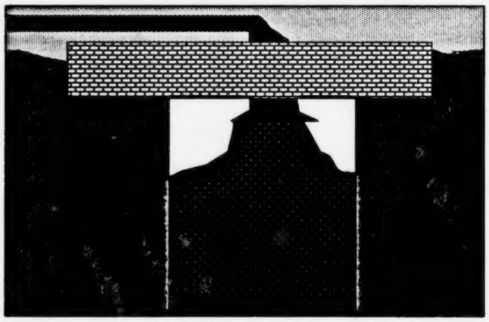


SURFACE WATER





LAND



UNDERGROUND

Table 7-10. The 20 Facilities with the Greatest Increases in Releases and Transfers for Chemicals Reported in 1987 and 1988.

FACILITY NAME	CITY, COUNTY, STATE	1987 DATA			1988 DATA			1987-1988 INCREASE FOR MATCHED CHEMICALS	
		CHEMICALS REPORTED 1987 ONLY Pounds	CHEMICALS REPORTED BOTH YEARS Pounds	TOTAL RELEASES & TRANSFERS FOR 1987 Pounds	CHEMICALS REPORTED 1988 ONLY Pounds	CHEMICALS REPORTED BOTH YEARS Pounds	TOTAL RELEASES & TRANSFERS FOR 1988 Pounds	Pounds	Percent
Amax Magnesium	Tooele, Tooele, UT	0	76,992,400	76,992,400	0	109,750,090	109,750,090	32,757,690	42.55
ITT Rayonier (b)	Fernandina Beach, Nassau, FL	23,500	22,105,750	22,129,250	123,000	54,246,100	54,369,100	32,140,350	145.39
Inland Steel Co.	East Chicago, Lake, IN	0	31,466,950	31,466,950	53,800	61,310,700	61,364,500	29,843,750	94.84
Vulcan Chemicals	Wichita, Sedgwick, KS	9,915	67,280,053	67,289,968	27,000	91,984,960	92,011,960	24,704,907	36.72
Du Pont Beaumont Works (a)	Beaumont, Jefferson, TX	967,300	84,503,300	85,470,600	6,064,532	105,835,397	111,899,929	21,332,097	25.24
Racon Inc.	Wichita, Sedgwick, KS	8,200	30,730,432	30,738,632	0	51,215,854	51,215,854	20,485,422	66.66
Logan Aluminum	Russellville, Logan, KY	0	641,450	641,450	36,835	16,371,734	16,408,569	15,730,284	2,452.30
Chevron Chemical Co.	Rock Springs, Sweetwater, WY	0	119,449	119,449	0	15,384,002	15,384,002	15,264,553	12,779.14
Monsanto Co.	Cantonment, Escambia, FL	23,600	23,866,950	23,890,550	0	36,249,190	36,249,190	12,382,240	51.88
Midwest Steel	Portage, Porter, IN	0	17,332,792	17,332,792	37,895	29,366,820	29,404,715	12,034,028	69.43
Occidental Chemical Corp.	Deer Park, Harris, TX	500	3,728,950	3,729,450	40,580	12,574,194	12,614,774	8,845,244	237.20
Allied-Signal Inc.	Elizabeth, Union, NJ	411	19,488,708	19,489,119	32	28,290,588	28,290,620	8,801,880	45.16
Delano Growers Grape Products	Delano, Kern, CA	0	1,295,780	1,295,780	37,720	9,580,980	9,618,700	8,285,200	639.40
BASF Corp.	Geismar, Ascension, LA	44,713	29,836,570	29,881,283	4,480	37,260,518	37,264,998	7,423,948	24.88
Triad Chemical	Donaldsonville, Ascension, LA	0	20,521,651	20,521,651	0	27,666,682	27,666,682	7,145,031	34.82
Du Pont Belle Plant	Belle, Kanawha, WV	337,618	2,394,438	2,732,056	0	9,099,913	9,099,913	6,705,475	280.04
Westvaco Corp. Chemical Div.	Covington, Alleghany, VA	0	1,657,779	1,657,779	0	7,425,647	7,425,647	5,767,868	347.93
USS Fairless Works	Fairless Hills, Bucks, PA	2,918,216	5,935,271	8,853,487	700	11,460,120	11,460,820	5,524,849	93.09
Uniroyal Plastics Co. Inc.	Mishawaka, St. Joseph, IN	18,200	1,545,306	1,563,506	135,703	6,767,182	6,902,885	5,221,876	337.92
Du Pont Louisville Works	Louisville, Jefferson, KY	0	26,113,000	26,113,000	0	31,305,496	31,305,496	5,192,496	19.88
TOTAL		4,352,173	467,556,979	471,909,152	6,562,277	753,146,167	759,708,444	285,589,188	61.08

(a) Corrections to the data change this facility's increase to a decrease of 5,769,100 pounds (see Box 3-C).

(b) Corrections to the data change this facility's increase from 21,332,097 pounds to 31,332,097 pounds (see Box 3-C).

Note: Data are shown for all chemicals reported by the facility, but the increase is only calculated for chemicals reported in both years.

CHAPTER 8. CHANGES IN TRI RELEASES, 1987–1988: MATCHED CHEMICAL DATA

This chapter continues the analysis of *matched chemicals* (those reported in both 1987 and 1988 by facilities that reported in both years) and focuses exclusively on environmental *releases* to air, water, land or underground. Off-site transfers are examined in detail in the next chapter. (See Figure 8-1.)

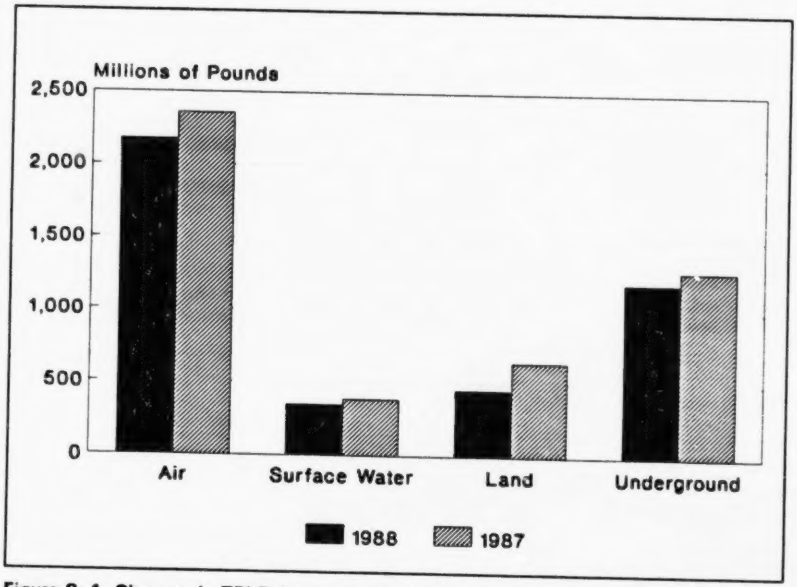


Figure 8-1. Changes in TRI Releases of Matched Chemicals, 1987-1988.

AIR EMISSIONS

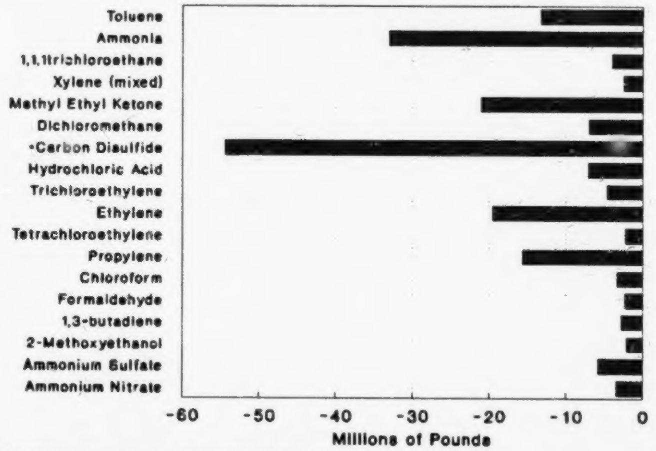
Air emissions of matched chemicals decreased by 8%.

Ninety-four percent (2.2 billion pounds) of total 1988 air emissions (2.3 billion pounds) were of chemicals also emitted to air in 1987. The remaining six percent (131.7 million pounds) of 1988 air emissions was of chemicals not previously reported. (See Table 7-4 in Chapter 7.) Total air emissions of matched chemicals—those reported both years—dropped eight percent (181.6 million pounds). Fugitive air emissions decreased more than point source emissions, dropping by 106.3 million pounds (14 percent), while point source emissions dropped 75.3 million pounds (five percent).

Chemical Distribution

Ammonia, methyl ethyl ketone, and ethylene decreased the most.

Air emissions of 18 chemicals decreased by one million pounds or more from 1987 to 1988. Ammonia decreased by the greatest amount,[1] from 266.4 to 233.4 million pounds, a decrease of 33.0 million pounds or 12 percent. Air emissions of methyl ethyl ketone decreased by the second greatest amount, from 135.9 to 114.9 million pounds (21.0 million pounds, or 16 percent). Ethylene and propylene also dropped significantly. (See Figure 8-2 and Table 8-1.)



•1988 data correction adds 42.9 M lbs. (see Box 3-C).

Figure 8-2. TRI Chemicals with the Greatest Decreases in Matched Emissions to Air, 1987-1988. (Chemicals shown in descending order according to rank for 1988 totals.)

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(1) Carbon disulfide appears to have the largest decrease in Table 8-2, but corrections made to the TRI database after analyses for this report were completed eliminated that decrease. (See Box 3-C.)

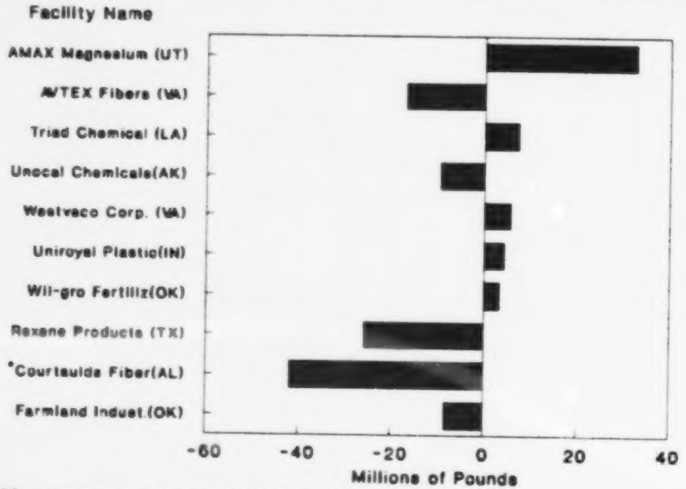
Table 8-1. Changes in TRI Air Emissions of Matched Chemicals,* 1987-1988.

CHEMICAL	1988 AIR Pounds	1987 AIR Pounds	1987-1988 CHANGE Pounds	Percent
TOLUENE	234,717,650	248,022,025	-13,304,375	-5.36
AMMONIA	233,376,811	266,414,033	-33,037,222	-12.40
METHANOL	195,594,094	189,916,229	5,677,865	2.99
ACETONE	173,190,213	172,829,125	361,088	0.21
1,1,1-TRICHLOROETHANE	135,415,391	139,423,607	-4,008,216	-2.87
CHLORINE	132,109,750	104,979,703	27,130,047	25.84
XYLENE (MIXED ISOMERS)	123,942,700	126,475,654	-2,532,954	-2.00
METHYL ETHYL KETONE	114,921,167	135,941,308	-21,020,141	-15.46
DICHLOROMETHANE	104,744,440	111,726,722	-6,982,282	-6.25
CARBON DISULFIDE	77,405,878	131,851,244	-54,445,366	-41.29
FREON 113	51,893,405	49,464,207	2,429,198	4.91
HYDROCHLORIC ACID	51,388,510	58,437,467	-7,048,957	-12.06
TRICHLOROETHYLENE	40,786,431	45,462,780	-4,676,349	-10.29
ETHYLENE	38,627,794	58,151,828	-19,524,034	-33.57
GLYCOL ETHERS	34,871,647	35,614,250	-742,603	-2.09
N-BUTYL ALCOHOL	30,356,227	30,839,190	-482,963	-1.57
BENZENE	27,076,996	27,783,382	-706,386	-2.54
STYRENE	26,657,097	26,920,142	-263,045	-0.98
TETRACHLOROETHYLENE	26,458,335	28,693,809	-2,235,474	-7.79
METHYL ISOBUTYL KETONE	24,200,832	25,615,131	-1,414,299	-5.52
PROPYLENE	21,620,208	37,234,235	-15,614,027	-41.93
CHLOROFORM	21,277,951	24,640,476	-3,362,525	-13.65
CARBONYL SULFIDE	18,043,351	19,860,170	-1,816,819	-9.15
SULFURIC ACID	15,476,189	15,251,506	224,683	1.47
CHLORINE DIOXIDE	12,262,662	11,843,461	419,201	3.54
ETHYLENE GLYCOL	11,827,439	13,363,675	-1,536,236	-11.50
HYDROGEN FLUORIDE	10,863,964	11,193,481	-329,517	-2.94
NITRIC ACID	9,824,543	6,403,606	3,420,937	53.42
FORMALDEHYDE	9,290,683	11,651,030	-2,360,347	-20.26
CYCLOHEXANE	9,132,017	9,740,274	-608,257	-6.24
PHENOL	8,530,144	7,421,135	1,109,009	14.94
CHLOROMETHANE	7,911,048	9,236,166	-1,325,118	-14.35
1,3-BUTADIENE	6,355,467	9,124,033	-2,768,566	-30.34
P-XYLENE	6,218,049	6,254,450	-36,401	-0.58
ACETALDEHYDE	5,674,040	5,705,252	-31,212	-0.55
2-METHOXYETHANOL	5,601,964	7,734,502	-2,132,538	-27.57
VINYL ACETATE	5,546,472	6,166,503	-620,031	-10.05
ETHYLBENZENE	5,227,265	5,433,098	-205,833	-3.79
SUBTOTAL	2,068,418,824	2,232,818,889	-164,400,065	-7.36
TOTAL FOR ALL OTHERS	104,220,204	121,378,625	-17,158,421	-14.14
GRAND TOTAL	2,172,639,028	2,354,197,514	-181,558,486	-7.71

* Chemicals with the largest matched air emissions for 1988.

These decreases are almost always attributable to large decreases at one or two facilities. For example, two of the five facilities with the largest reductions in air emissions were primarily responsible for the decrease of ammonia: Unocal Chemicals (Kenai, Alaska) and Farmland Industries, Inc. (Enid, Oklahoma) decreased ammonia emissions by 9.5 and 6.5 million pounds, respectively. Similarly, Rexene Products Co. (Odessa, Texas) reported a decrease of 18.1 million pounds in air emissions of ethylene and 6.9 million pounds of propylene: it was almost completely responsible for the net reduction of these two compounds. (See Figure 8-3 and Table 8-2.)

A few facilities with large decreases dominated the patterns of change.



• 1988 data correction adds 42.9 M lbs. (see Box 3-C).

Figure 8-3. TRI Facilities with the Greatest Changes in Matched Air Emissions, 1987-1988.

Table 8-2. TRI Facilities with the Greatest Changes in Matched Air Emissions

SIC CODE	FACILITY NAME	CITY, COUNTY, STATE	1987 AIR		1988 AIR		MAJOR CHEMICAL(S)	
			Pounds	Percent*	Pounds *	Percent	Name	Pounds
THE FIVE FACILITIES WITH THE LARGEST DECREASES								
28	Courtaulds Fibers Inc.**	Axis, Mobile, AL	42,293,605	98.04	432,455	3.79	Carbon disulfide	-41,861,000
28	Rexene Products Co.	Odessa, Ector, TX	28,396,760	99.25	2,559,964	57.57	Ethylene Propylene	-18,128,207 -6,919,876
28	AVTEX Fibers Front Royal Inc.	Front Royal, Warren, VA	50,990,000	94.37	34,000,250	90.11	Carbon disulfide Chlorine	-15,390,000 -1,600,000
28	Unocal Chemicals Div.	Kenai, Kenai, AK	30,186,400	99.24	20,660,250	99.22	Ammonia Formaldehyde	-9,521,500 -4,650
28	Farmland Industries Inc.	Enid, Garfield, OK	8,281,750	99.99	2,414	70.65	Ammonia Methanol	-6,479,838 -1,799,998
THE FIVE FACILITIES WITH THE LARGEST INCREASES								
33	AMAX Magnesium	Tooele, Tooele, UT	76,958,950	99.96	109,748,910	100.00	Chlorine	34,038,000
28	Triad Chemical	Donaldsville, Ascension, LA	19,817,970	96.57	27,140,610	98.10	Manganese cmpds. Ammonia	500.00 7,408,060
28	Westvaco Corp.	Covington, Alleghany, VA	693,779	41.85	6,293,647	84.76	Methanol	5,629,995
28	Uniroyal Plastics Co. Inc.	Mishawaka, St Joseph, IN	1,097,106	70.17	5,359,858	77.65	Toluene Acetone	3,235,783 410,044
28	Wil-gro Fertilizer Inc.	Pryor, Mayes, OK	868,250	38.67	4,186,166	99.80	Nitric acid	3,000,750

* Percent that air emissions comprise of the facility's matched releases and transfers.
** Corrections to the data add 42,900,000 pounds to 1988 air emissions (see Box 3-C).

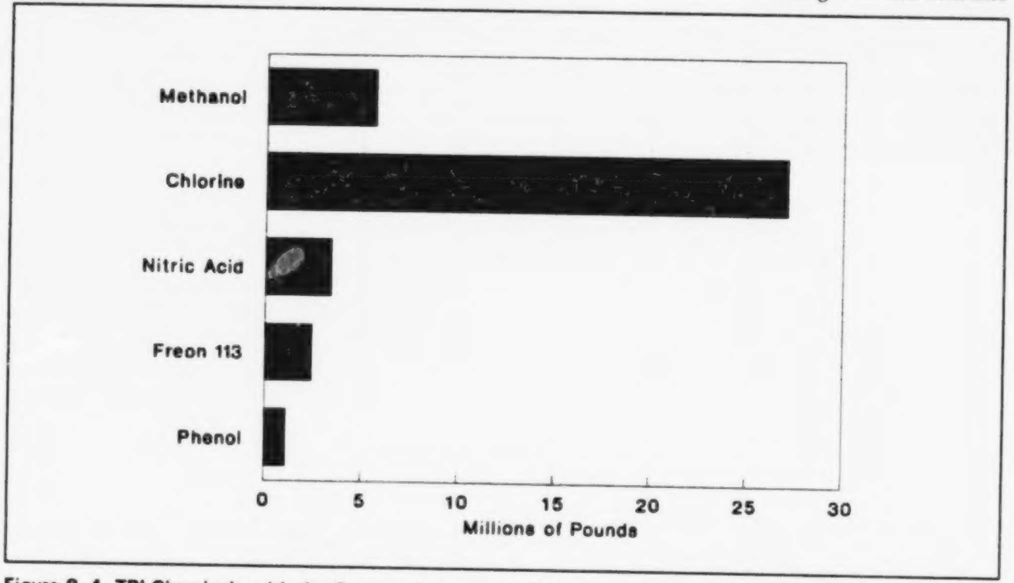


Figure 8-4. TRI Chemicals with the Greatest Increases in Matched Emissions to Air, 1987-1988. Chemicals shown in descending order according to 1988 totals.

Matched air emissions of five chemicals increased by more than one million pounds. Air emissions of chlorine increased 26 percent (27.1 million pounds), more than any other chemical. As with decreases, most large increases originated at just a few facilities. Amax Magnesium (Tooele, Utah) increased its air emissions of chlorine by 34.0 million pounds, making it largely responsible for the net increase. A 5.7-million-pound (three percent) increase of methanol was due mostly to an increase of 5.6 million pounds by a Westvaco Corporation facility (Covington, Virginia). Nitric acid emissions increased 3.4 million pounds (53 percent), mostly produced by increases of 3.0 million pounds by Wil-gro Fertilizer Inc. (Pryor, Oklahoma). (See Figure 8-3.)

Air emissions of chlorine, methanol, nitric acid, Freon 113, and phenol each increased by more than 1 million pounds.

Other chemicals that increased by more the one million pounds were Freon 113 and phenol. Freon 113 emissions were up 2.4 million pounds (five percent) in 1988 from a total of 49.5 million pounds in 1987. No single facility accounted for the increase of this chemical. (When emitted to air, Freon 113 depletes the ozone layer, damaging the protective barrier that absorbs much of the sun's radiation before it strikes the earth. The increased radiation received by the earth's surface may raise the risks of skin cancer. See Chapter 12.)

Chemical Classes

Air emissions decreased for all chemical classes; organics and halo-organics decreased the most.

Air emissions of all chemical classes decreased from 1987 to 1988. The large changes in air emissions of one or more individual chemicals noted above dominated the changes in each class. Air emissions of organics dropped ten percent (138.8 million pounds), more than the decrease for any other class. Emissions of four out of the 144 organic chemicals—methyl ethyl ketone, ethylene, propylene, and toluene—accounted for nearly half of the net decrease (69.4 million pounds). Halo-organic chemicals decreased by 21.3 million pounds (five percent), due to decreased air emissions of dichloromethane, trichloroethylene, 1,1,1-trichloroethane and chloroform totaling 19.0 million pounds that outweighed the 2.4-million-pound increase of Freon 113. (See Figure 8-5 and Table 8-A (at end of chapter). See also Chapter 4 for an explanation of chemical classes and Appendix B for a complete list of the chemicals in each class.)

Air emissions of the acids/bases/salts class decreased 13.0 million pounds (12 percent) with hydrochloric acid, ammonium sulfate, and ammonium nitrate playing the leading roles. Decreases of the three totaled 16.4 million pounds, but were somewhat diminished by the 3.4-million-pound increase of nitric acid.

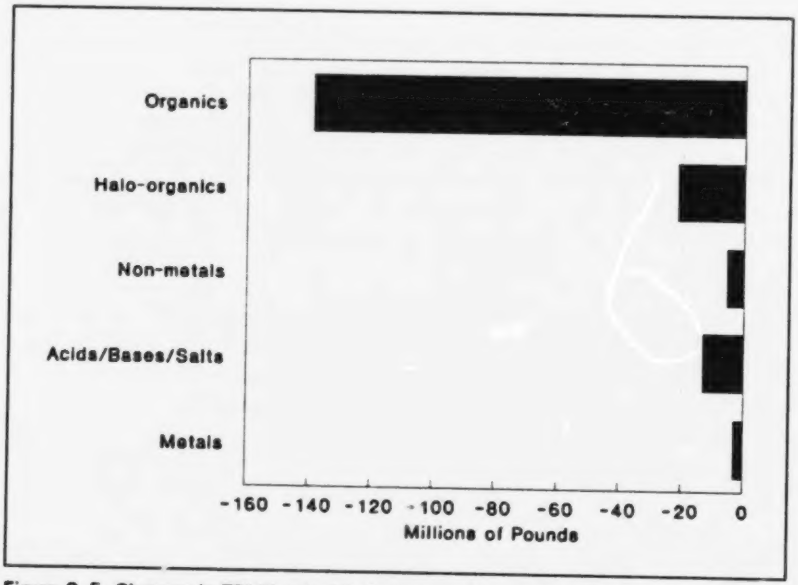


Figure 8-5 Changes in TRI Matched Emissions to Air by Chemical Class, 1987–1988. Classes shown in descending order according to 1988 totals.

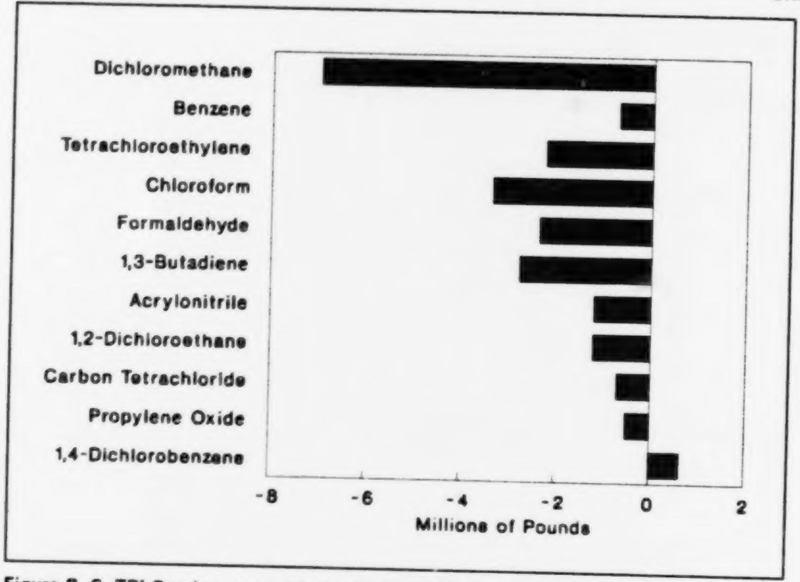


Figure 8-6. TRI Carcinogens with the Greatest Changes in Matched Air Emissions, 1987-1988. Carcinogens shown in descending order according to 1988 totals.

Carcinogens

Air emissions of 75 of the 123 carcinogens on the TRI list were reported in 1987 and 1988, but only seven dropped by one million pounds or more. Dichloromethane decreased the most, by 7.0 million pounds (six percent). Emissions of chloroform decreased 3.4 million pounds (14 percent), and 1,3-butadiene decreased 2.8 million pounds (30 percent). (See Figure 8-6 and Table 8-3.)

Matched air emissions of carcinogens decreased by 9%.

Few carcinogens increased in sizable amounts from 1987 to 1988. Only 1,4-dichlorobenzene increased by more than 500,000 pounds in 1988, expanding from 1.2 million pounds in 1987 to 1.8 million pounds in 1988 (55 percent). Acetonitrile increased 200,000 pounds, the next largest gain for any carcinogen.

1,4-dichlorobenzene emissions increased 600,000 pounds.

NESHAPs

The eight TRI chemicals and chemical categories regulated by National Emissions Standards for Hazardous Air Pollutants (NESHAPs) accounted for one percent of total air emissions of matched chemicals in 1988, as in 1987. Emissions of these chemicals decreased 1.0 million pounds (three percent). Benzene and vinyl chloride decreased by the largest amounts, dropping to 706,000 and 282,000 pounds (3 and 18 percent respectively). In both cases, however, a decrease in *fugitive emissions* was accompanied by an increase in *point source emissions*. (See Figure 8-7 and Table 8-4.)

Hazardous air pollutants (NESHAPs) decreased by 1.0 million pounds (3%).

Table 8-3. Changes in Matched Air Emissions of Carcinogens, 1987-1988.

CHEMICAL	1988 AIR Pounds	1987 AIR Pounds	1987-1988 CHANGE Pounds	Percent
DICHLOROMETHANE	104,744,440	111,726,722	-6,982,282	-6.25
BENZENE	27,076,996	27,783,382	-706,386	-2.54
STYRENE	26,657,097	26,920,142	-263,045	-0.98
TETRACHLOROETHYLENE	26,458,335	28,693,809	-2,235,474	-7.79
CHLOROFORM	21,277,951	24,640,476	-3,362,525	-13.65
FORMALDEHYDE	9,290,683	11,651,030	-2,360,347	-20.26
1,3-BUTADIENE	6,355,467	9,124,033	-2,768,566	-30.34
ETHYLENE OXIDE	4,213,564	4,584,426	-370,862	-8.09
ACRYLONITRILE	4,207,505	5,406,313	-1,198,808	-22.17
1,2-DICHLOROETHANE	3,830,078	5,039,275	-1,209,197	-24.00
CARBON TETRACHLORIDE	3,734,094	4,429,594	-695,500	-15.70
PROPYLENE OXIDE	2,873,616	3,390,265	-516,649	-15.24
ACETONITRILE	1,850,311	1,603,800	246,511	15.37
1,4-DICHLOROBENZENE	1,805,797	1,161,430	644,367	55.48
VINYL CHLORIDE	1,302,317	1,584,336	-282,019	-17.80
LEAD	736,968	815,158	-78,190	-9.59
DI-(2-ETHYLHEXYL) PHTHALATE	659,168	1,147,262	-488,094	-42.54
EPICHLOROHYDRIN	396,182	345,934	50,248	14.53
2-NITROPROPANE	373,394	415,541	-42,147	-10.14
CHROMIUM	209,322	223,436	-14,114	-6.32
ETHYL ACRYLATE	200,548	220,245	-19,697	-8.94
1,4-DIOXANE	181,079	219,951	-38,872	-17.67
NICKEL	170,454	178,453	-7,999	-4.48
TOLUENE-2,4-DIISOCYANATE	147,495	353,760	-206,265	-58.31
URETHANE	140,000	419,450	-279,450	-66.62
DICHLOROBENZENE (MIXED ISOMERS)	76,052	67,909	8,143	11.99
[illegible]CHLOROPROPYLENE	50,110	34,070	16,040	47.08
[illegible]DIBROMOETHANE	45,842	51,026	-5,184	-10.16
[illegible]TOLUIDINE	45,017	53,754	-8,737	-16.25
[illegible],1,2,2-TETRACHLOROETHANE	44,918	40,474	4,444	10.98
TOLUENE-2,6-DIISOCYANATE	32,424	374,957	-342,533	-91.35
ASBESTOS (FRIABLE)	32,210	35,470	-3,260	-9.19
4,4'-METHYENEDIANILINE	30,000	42,747	-12,747	-29.82
BIS(2-ETHYLHEXYL) ADIPATE	28,239	93,346	-65,107	-69.75
BENZOIC TRICHLORIDE	24,963	23,760	1,203	5.06
HYDRAZINE	24,130	22,849	1,281	5.61
ACRYLAMIDE	22,040	32,932	-10,892	-33.07
DIAMINOTOLUENE (MIXED ISOMERS)	19,800	48,627	-28,827	-59.28
SUBTOTAL	249,368,606	273,000,144	-23,631,538	-8.66
TOTAL FOR NONCARCINOGENS	1,923,270,422	2,081,197,370	-157,926,948	-7.59
GRAND TOTAL	2,172,639,028	2,354,197,514	-181,558,486	-7.71

Table 8-4. Changes in TRI Matched Air Emissions of NESHAPS Chemicals, 1987-1988.

CHEMICAL	1988 TOTAL AIR Pounds	1987 TOTAL AIR Pounds	1987-1988 CHANGE IN AIR Pounds	Percent
BENZENE	27,076,996	27,783,382	-706,386	-2.54
VINYL CHLORIDE	1,302,317	1,584,336	-282,019	-17.80
ARSENIC COMPOUNDS	180,962	175,704	5,258	2.99
ASBESTOS (FRIABLE)	32,210	35,470	-3,260	-9.19
MERCURY	21,514	21,389	125	0.58
ARSENIC	3,651	4,071	-420	-10.32
BERYLLIUM	2,703	2,751	-48	-1.74
MERCURY COMPOUNDS	1,616	2,335	-719	-30.79
BERYLLIUM COMPOUNDS	612	501	111	22.16
SUBTOTAL	28,622,581	29,609,939	-987,358	-3.33
TOTAL FOR ALL OTHERS	2,144,016,447	2,324,587,575	-180,571,128	-7.77
GRAND TOTAL	2,172,639,028	2,354,197,514	-181,558,486	-7.71

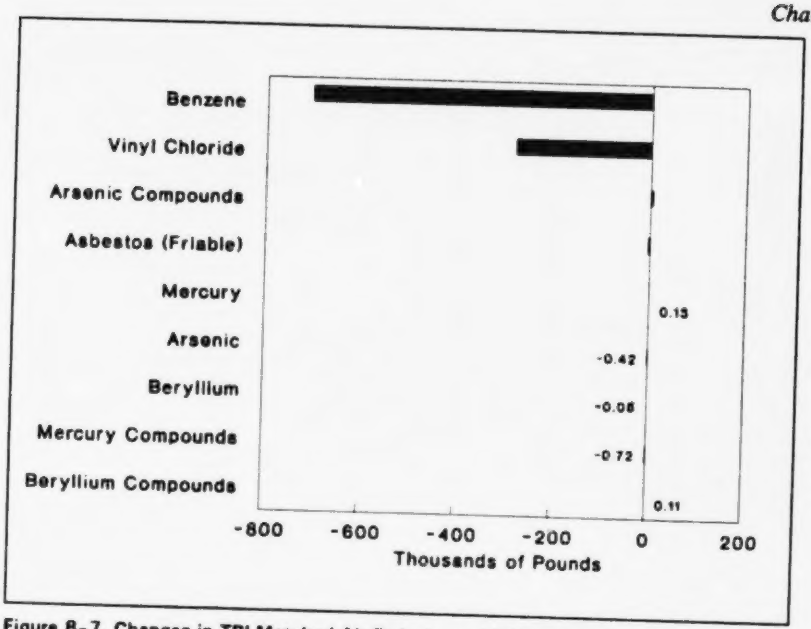


Figure 8-7. Changes in TRI Matched Air Emissions of NESHAPs Chemicals, 1987-1988. Chemicals shown in descending order according to 1988 totals.

Fugitive air emissions of all NESHAPs decreased by 2.1 million pounds (11 percent), but were offset by an increase of 1.2 million pounds (12 percent) in point source emissions. Indeed, point source emissions of all NESHAP chemicals except asbestos and mercury compounds increased. Benzene point source emissions increased by 1.1 million pounds (13 percent). Increases in point source emissions of NESHAP chemicals are of potential concern because these hazardous air pollutants may pose serious human health hazards. Benzene, vinyl chloride, arsenic and beryllium are all carcinogens. Mercury is associated with central nervous system toxicity. Arsenic compounds and beryllium compounds are both associated with a wide range of toxic effects.

***Point source* air emissions of all NESHAP chemicals except asbestos and mercury increased.**

Geographical Distribution

Matched facilities in Texas, which generated the largest total air emissions in both 1987 and 1988, reported a larger decrease[2] (40.5 million pounds, 21 percent) than any other state. Rexene Products Co. (Odessa, Texas), reported decreases of 25.8 million pounds (comprised mostly of ethylene and propylene), which

Air emissions in Texas decreased by 40.5 million pounds . . .

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(2) Table 8-A shows that Alabama facilities reported the largest decrease (44.0 million pounds), but this decrease was eliminated by corrections to the TRI database after analyses for this report were prepared. (See Box 3-C.)

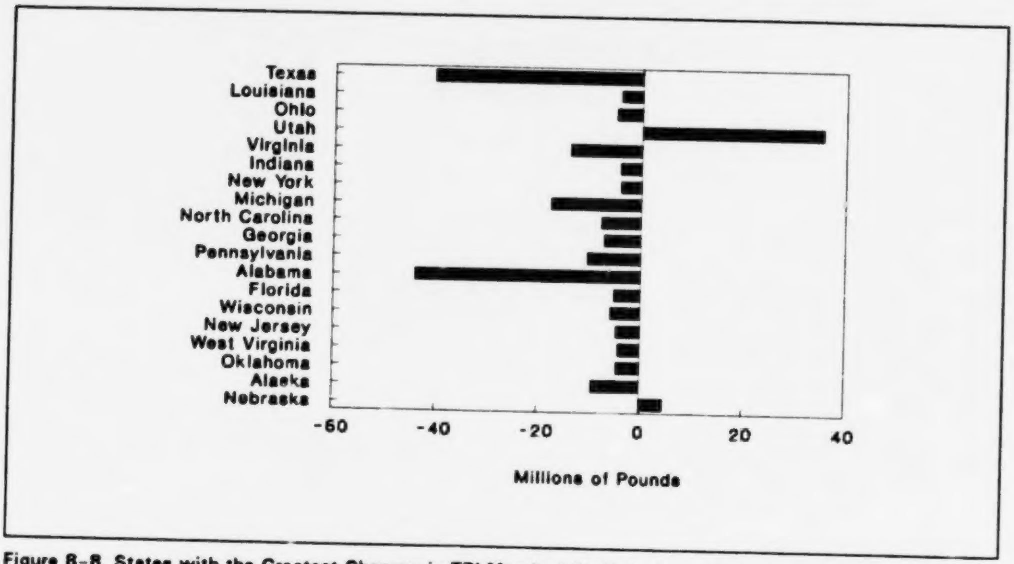


Figure 8-8. States with the Greatest Changes in TRI Matched Air Emissions, 1987–1988. (States shown in descending order according to 1988 totals for air emissions.)

alone accounted for a large share of the decreases in the state. (See Figure 8-8 and Table 8-B (at end of chapter). See also Table D-3 in Appendix D for data on fugitive and point source emissions by state.)

. . . but the decrease was largely offset by a 35.6-million-pound increase in Utah.

Utah facilities reported the largest net increases in air emissions. Matched chemical emissions increased from 82.7 to 118.2 million pounds—an increase of 35.6 million pounds (43 percent). Most of the increase for the state originated at just one facility, an Amax Magnesium plant (Tooele, Utah), that augmented chlorine emissions by 34.0 million pounds (although the facility did reduce other chemicals, so its net increase was 32.8 million pounds).

Net emissions increases were considerably smaller in each of the ten other states where emissions were reported. For example, Triad Chemicals (Donaldsonville, Louisiana), increased its air emissions by 7.3 million pounds—one of the top-ranked individual increases—but the increase was outweighed by decreases from other Louisiana facilities, so emissions for the state as a whole dropped 4.1 million pounds (3 percent). (See Tables 8-2 and 8-B.)

Industrial Distribution

Facilities in 17 industries reported decreases in air emissions of matched chemicals from 1987 to 1988. The largest increases and decreases were generated by industries producing the greatest proportion of air emissions. Facilities in the Chemical industry generated the largest share of air emissions in both 1987 and 1988 (36 and 33 percent respectively). They also generated the largest decreases, cutting emissions from 856.4 to 724.4 million pounds (132.0 million pounds, or 15 percent). The five individual facilities with the largest air emissions decreases, all Chemical plants, together reported emissions reductions of 102.5 million pounds, accounting for over three quarters of the industry-wide decrease. Paper manufacturing facilities produced the next largest decrease, cutting emissions from 215.9 million pounds in 1987 to 178.0 million pounds in 1988 (37.9 million pounds, or 18 percent). (See Figure 8-9 and Table 8-C, at end of Chapter.)

Facilities in the Chemical industry reduced air emissions more than any other industry — 132.0 million pounds (15%); Paper manufacturers cut emissions by 37.9 million pounds.

Facilities in five industries reported increases in air emissions from 1987 to 1988. The Primary Metals industry increased emissions the most from 189.0 to 214.8 million pounds (14 percent), largely due to the 32.8-million-pound increase reported by Amax Magnesium plant (Tooele, Utah). Facilities with multiple SIC codes reported an increase of 17.9 million pounds (ten percent), the second largest of any industry group.

Primary Metals plants increased air emissions by 26 million pounds.

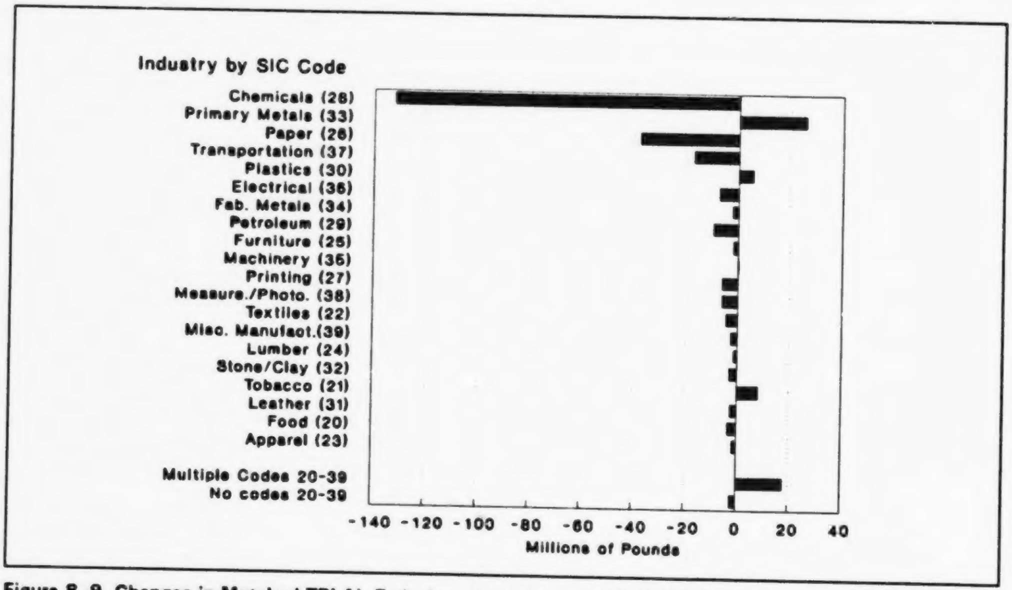


Figure 8-9. Changes in Matched TRI Air Emissions by Industry, 1987–1988. (Industries shown in descending order according to 1988 air emissions totals.)

DISCHARGES TO SURFACE WATER

Discharges to surface water decreased 42 million pounds (11%).

Discharges of matched chemicals to surface water decreased by 42.0 million pounds (11 percent) from 1987 to 1988. Overall, surface water releases comprised the same percentage (six percent) of the total matched releases and transfers for 1987 and 1988.

Chemical Distribution

More chemicals decreased than increased.

Of the 210 matched chemicals discharged to surface water, discharge amounts increased for 80 TRI chemicals, decreased for 124, and stayed the same for six. No matched discharges to surface water were reported for the other TRI chemicals.

Discharges of arsenic decreased by nearly 100%, due to reductions reported by a Kerr-McGee plant.

Discharges of ten chemicals decreased by more than one million pounds each. Arsenic compounds decreased the most, by 10.4 million pounds—nearly 100 percent. The decreases originated at a single facility, Kerr-McGee Chemical Corporation (Trona, California), which reported decreasing discharges by 10.5 million pounds. Other chemicals that decreased in notable amounts were phosphoric acid, sulfuric acid, and hydrochloric acid. (See Figures 8–10 and 8–11 and Tables 8–5 and 8–6.)

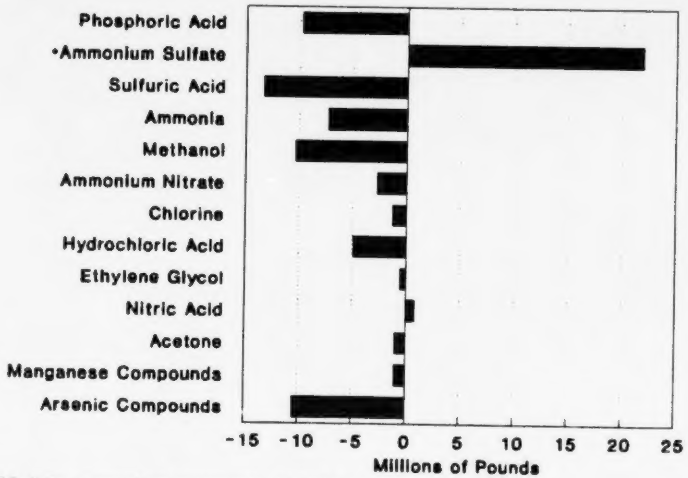
Few chemicals increased in amounts larger than 100,000 pounds.

Surface water discharges of ammonium sulfate, the top-ranking TRI chemical overall in 1988 appeared to increase the most—from 88.8 million pounds in 1987 to 110.8 million pounds in 1988. However, the increase was due largely to an error in the TRI database that was corrected *after* analyses for this report were completed (see Box 3-C, Chapter 3). Outside of this apparent increase, net increases in surface water discharges were all less than 800,000 pounds. Discharges of nitric acid went up 764,000 pounds, and sec-butyl alcohol, which had the next largest decrease, went up 120,000 pounds.

Chemical Classes

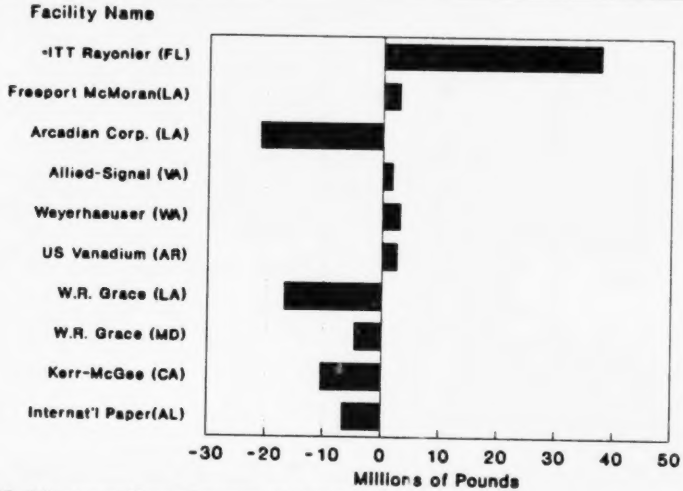
Discharges of nonmetallic inorganics decreased by 42%, mostly due to Kerr-McGee's reduction of arsenic compounds.

Discharges to surface water decreased for all five classes of chemicals. Nonmetallic inorganics decreased by 19.2 million pounds (42 percent), reducing surface water releases of this class from 45.7 million pounds in 1987 to 26.5 million pounds in 1988. This was the largest of any decrease and was sufficient to cut the class's contribution from 12 to eight percent of the surface water total. Much of the decrease resulted from the 10.5-million-pound decrease in surface water discharges of arsenic compounds by the Kerr-McGee facility mentioned above. (See Figure 8–12 and Table 8–A, at end of Chapter.)



•1988 data correction subtracts 48.6 M lbs.

Figure 8-10. TRI Chemicals with the Greatest Changes in Matched Discharges to Surface Water, 1987-1988. Chemicals shown in descending order according to 1988 TRI total discharges to surface water.



•1988 data correction subtracts 48.6 M lbs.

Figure 8-11. TRI Facilities with the Greatest Changes in Matched Discharges to Surface Water, 1987-1988. Facilities shown in descending order according to 1988 TRI total discharges to surface water.

Table 8-5. Changes in TRI Discharges to Surface Water of Matched Chemicals,* 1987-1988.

CHEMICAL	1988 SURFACE WATER Pounds	1987 SURFACE WATER Pounds	1987-1988 CHANGE Pounds	Percent
PHOSPHORIC ACID	116,647,186	126,493,709	-9,846,523	-7.78
AMMONIUM SULFATE**	110,790,003	88,849,585	21,940,418	24.69
SULFURIC ACID	44,544,556	57,798,546	-13,253,990	-22.93
AMMONIA	21,432,316	28,774,738	-7,342,422	-25.52
METHANOL	14,536,204	24,812,465	-10,276,261	-41.42
AMMONIUM NITRATE	8,519,966	11,208,090	-2,688,124	-23.98
CHLORINE	5,014,497	6,337,846	-1,323,349	-20.88
HYDROCHLORIC ACID	4,049,507	8,908,629	-4,859,122	-54.54
ETHYLENE GLYCOL	3,389,765	3,895,227	-505,462	-12.98
NITRIC ACID	2,899,230	2,134,768	764,462	35.81
CHLOROFORM	1,013,545	1,174,743	-161,198	-13.72
ACETONE	1,009,904	2,023,802	-1,013,898	-50.10
FORMALDEHYDE	869,605	1,084,207	-214,602	-19.79
ZINC COMPOUNDS	813,773	1,130,794	-317,021	-28.04
METHYL ISOBUTYL KETONE	761,792	1,101,942	-340,150	-30.87
MANGANESE COMPOUNDS	585,290	1,590,105	-1,004,815	-63.19
1,3-BUTADIENE	412,503	432,417	-19,914	-4.61
DIETHANOLAMINE	343,510	335,838	7,672	2.28
ZINC (FUME OR DUST)	329,209	394,532	-65,323	-16.56
XYLENE (MIXED ISOMERS)	284,874	272,385	12,489	4.59
DICHLOROMETHANE	261,903	359,885	-97,982	-27.23
PHENOL	244,725	378,634	-133,909	-35.37
TOLUENE	221,152	321,046	-99,894	-31.12
CHROMIUM COMPOUNDS	209,985	300,502	-90,517	-30.12
SEC-BUTYL ALCOHOL	190,190	70,054	120,136	171.49
HYDROGEN FLUORIDE	175,896	198,050	-22,154	-11.19
GLYCOL ETHERS	166,427	93,315	73,112	78.35
CYANIDE COMPOUNDS	163,700	123,907	39,793	32.12
1,4-DIOXANE	159,707	131,151	28,556	21.77
LEAD COMPOUNDS	145,346	102,874	42,472	41.29
MOLYBDENUM TRIOXIDE	138,771	64,815	73,956	114.10
N-BUTYL ALCOHOL	126,433	149,845	-23,412	-15.62
4,4'-ISOPROPYLIDENEDIPHENOL	121,172	13,315	107,857	810.04
2-ETHOXYETHANOL	120,154	133,244	-13,090	-9.82
PROPYLENE OXIDE	112,503	68,499	44,004	64.24
CHLOROMETHANE	112,048	104,489	7,559	7.23
MANGANESE	109,361	326,830	-217,469	-66.54
LEAD	103,131	34,599	68,532	198.08
BENZENE	46,020	198,926	-152,906	-76.87
1,2,4-TRICHLOROBENZENE	31,563	141,538	-109,975	-77.70
ARSENIC COMPOUNDS	5,355	10,469,081	-10,463,726	-99.95
MIXTURES	27,000	0	27,000	—
TRADE SECRETS	0	0	0	—
SUBTOTAL	341,239,777	382,538,967	-41,299,190	-10.80
TOTAL FOR ALL OTHERS	1,973,984	2,655,662	-681,678	-25.67
GRAND TOTAL	343,213,761	385,194,629	-41,980,868	-10.90

*Chemicals with the largest matched surface water discharges for 1988, or with the greatest change from 1987 to 1988.

**Corrections to data subtract 48,600,000 pounds from 1988 surface water discharges (see Box 3-C).

A 10-million-pound reduction of methanol contributed to the 35% net decrease in discharges of organics.

The organics class decreased the next largest amount, dropping from 37.0 to 24.0 million pounds (35 percent). Although this class contains the greatest number of TRI chemicals, it constituted only seven percent of the pounds of matched surface water releases in 1988. The largest share of organics reductions was a 10.3-million-pound cut in methanol, much of which originated with a 6.6-million-pound cut by an International Paper mill (Mobile, Alabama). (See Table 8-6.)

Table 8-6. TRI Facilities with the Greatest Changes in Matched Discharges to Surface Water, 1987-1988.

SIC CODE	FACILITY NAME	CITY, COUNTY, STATE	1987 SURFACE WATER Pounds	1987 SURFACE WATER Percent*	1988 SURFACE WATER Pounds	1988 SURFACE WATER Percent*	MAJOR CHEMICAL(S) Name	MAJOR CHEMICAL(S) Pounds
THE FIVE FACILITIES REPORTING THE LARGEST DECREASES								
28	Arcadian Corp.	Geismar, Ascension, LA	53,990,000	95.65	32,980,250	92.50	Phosphoric acid Sulfuric acid	-12,000,000 -8,000,000
28	W. R. Grace & Co.	Sulphur, Calcasieu, LA	19,813,203	90.17	3,006,400	59.37	Ammonium sulfate Ammonia	-16,758,000 -48,803
28	Kerr-McGee Chemical Corp.	Trona, San Bernardino, CA	11,206,144	79.26	842,826	43.18	Arsenic Nickel compounds	-10,465,153 -6,687
26	International Paper	Mobile, Mobile, AL	6,911,871	89.11	315,000	25.85	Methanol Phosphoric acid	-6,595,000 -46,989
28	W.R. Grace &Co.	Baltimore, Baltimore City, MD	7,047,036	67.72	2,487,110	58.37	Ammonium sulfate Ammonium nitrate	-3,323,976 -1,224,019
THE FIVE FACILITIES REPORTING THE LARGEST INCREASES								
26	ITT Rayonier**	Fernandina Beach, Nassau, FL	16,195,000	73.18	54,011,100	99.34	Ammonium sulfate Ammonia	38,000,000 11,100
26	Weyerhauser Paper Co.	Cosmopolis, Grays Harbor, WA	3,351,400	90.44	6,442,900	95.95	Sulfuric acid	3,100,000
28	Freeport McMoran, Agrico Chemical	Donaldsonville, St. James, LA	44,401,510	75.15	47,299,000	76.51	Phosphoric acid Sulfuric acid	2,124,000 746,000
33	US Vanadium Corp.	Hot Springs Nat'l Park, Garland, AR	3,400,750	73.23	6,000,750	74.15	Ammonium sulfate Ammonia	2,600,000 8,354
28	Allied-Signal Inc.	Hopewell, Hopewell City, VA	17,259,000	34.63	18,930,647	42.30	Ammonium sulfate	2,200,00

* Percent that suface water discharges comprise of the facility's total TRI releases and transfers.
** Corrections to the data subtract 48.6 million pounds from this facility's 1988 discharges to surface water.

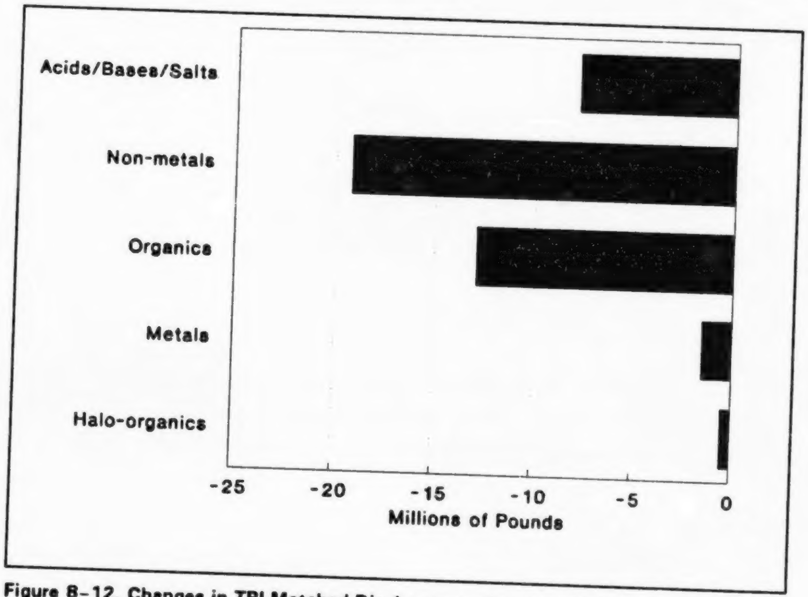


Figure 8-12. Changes in TRI Matched Discharges to Surface Water by Chemical Class, 1987-1988. Chemical classes shown in descending order according to 1988 total discharges.

Acids/bases/salts—the largest component of discharges to surface water—dropped only 3%.

Discharges of the acids/bases/salts class dropped by 7.9 million pounds. This amount represented only a three-percent decrease in surface water releases of acids/bases/salts, however, reducing these releases from 295.7 to 287.8 million pounds. In fact, discharges of other chemical classes decreased more, the proportion of acids/bases/salts in surface water discharges actually increased: the class comprised 84 percent of all matched releases to surface water in 1988 and 77 percent of surface water releases in 1987.

Carcinogens and Water Priority Pollutants

Discharges of 65 carcinogens and priority pollutants decreased; 37 increased.

Among the matched chemicals discharged to surface water in 1988, 106 are either carcinogens, water priority pollutants, or both. Of these, 29 are carcinogens but not designated water priority pollutants, 56 are water priority pollutants but not carcinogens, and 21 are both. Water priority pollutants are the 126 chemicals, mostly metallic and organic, that receive special regulatory attention as toxic chemicals under the Clean Water Act. (Chapter 4 defines TRI carcinogens, and Appendix B lists all TRI chemicals that are considered carcinogens and/or priority pollutants). Discharges of 65 carcinogens and/or water priority pollutants decreased from 1987 to 1988, while 37 increased, and four stayed the same.

Formaldehyde decreased by 20%; benzene decreased by 77%.

Three carcinogens—formaldehyde, chloroform, and benzene—each decreased by more than 100,000 pounds. Formaldehyde discharges decreased the most, dropping from 1.1 million pounds to 870,000 pounds (20 percent). Chloroform, which accounted for a larger portion of the surface water total than any other carcinogen, decreased by 161,000 pounds (14 percent), from 1.2 million pounds to 1.0 million pounds. Benzene had one of the largest *proportional* decreases—a 77-percent reduction that cut discharges from 199,000 to 46,000 pounds. (See Figure 8–13 and Table 8–7.)

Discharges did not increase by more than 100,000 pounds for any TRI carcinogen. The largest increase was a 69,000 pound addition to the discharges of lead (198 percent increase). Only two other carcinogens, propylene oxide and 1,4-dioxane, increased by more than 20,000 pounds.

7 priority pollutants were reduced by over 100,000 pounds each.

Surface water releases were reported for 77 out of the 94 TRI chemicals designated as water priority pollutants. Discharges of arsenic compounds and methanol each dropped more than ten million pounds, both due to large decreases by single facilities (Kerr-McGee and International Paper), as described above. Five other priority pollutants decreased more than 100,000 pounds. (See Table 8–7.)

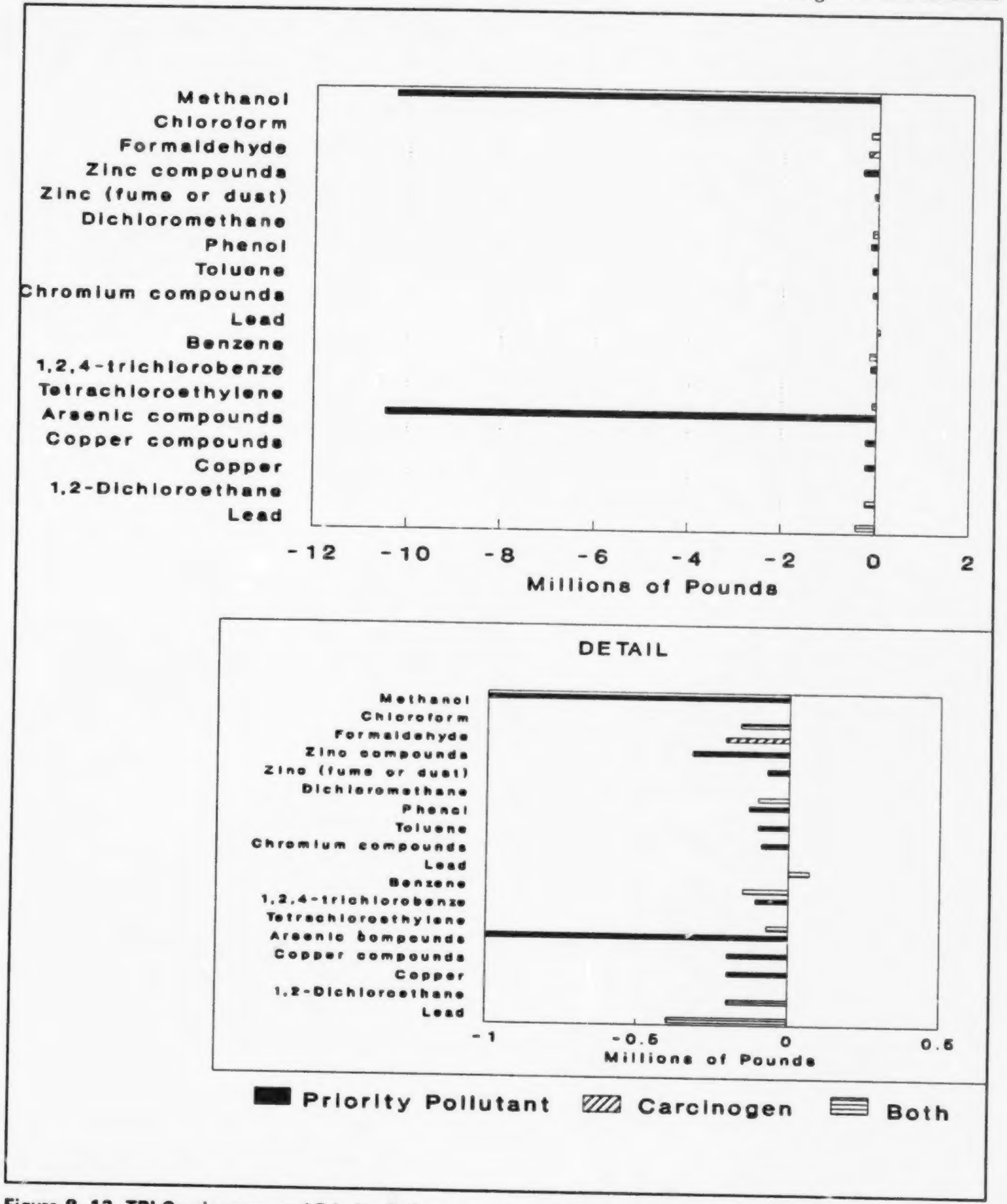


Figure 8-13. TRI Carcinogens and Priority Pollutants with the Greatest Changes in Matched Discharges to Surface Water, 1987-1988. Chemicals shown in descending order according to 1988 total surface water discharges.

Table 8–7. Changes in TRI Matched Discharges to Surface Water of Priority Pollutants and Carcinogens,* 1987–1988.

RATING**	CHEMICAL	1988 SURFACE WATER Pounds	1987 SURFACE WATER Pounds	1987-1988 CHANGE	
				Pounds	Percent
P	METHANOL	14,536,204	24,812,465	-10,276,261	-41.42
C, P	CHLOROFORM	1,013,545	1,174,743	-161,198	-13.72
C	FORMALDEHYDE	869,605	1,084,207	-214,602	-19.79
P	ZINC COMPOUNDS	813,773	1,130,794	-317,021	-28.04
C	1,3-BUTADIENE	412,503	432,417	-19,914	-4.61
P	ZINC (FUME OR DUST)	329,209	394,532	-65,323	-16.56
C, P	DICHLOROMETHANE	261,903	359,885	-97,982	-27.23
P	PHENOL	244,725	378,634	-133,909	-35.37
P	TOLUENE	221,152	321,046	-99,894	-31.12
P	CHROMIUM COMPOUNDS	209,985	300,502	-90,517	-30.12
P	CYANIDE COMPOUNDS	163,700	123,907	39,793	32.12
C	1,4-DIOXANE	159,707	131,151	28,556	21.77
P	LEAD COMPOUNDS	145,346	102,874	42,472	41.29
C	PROPYLENE OXIDE	112,503	68,499	44,004	64.24
P	CHLOROMETHANE	112,048	104,489	7,559	7.23
C, P	LEAD	103,131	34,599	68,532	198.08
P	2,4-DINITROPHENOL	98,692	86,700	11,992	13.83
P	CHLOROBENZENE	97,851	62,494	35,357	56.58
P	COPPER	97,804	79,332	18,472	23.28
P	COPPER COMPOUNDS	77,281	109,238	-31,957	-29.25
P	1,1,1-TRICHLOROETHANE	75,193	29,632	45,561	153.76
C, P	NICKEL	69,522	70,820	-1,298	-1.83
C, P	CHROMIUM	68,497	70,423	-1,926	-2.73
P	NICKEL COMPOUNDS	68,217	45,657	22,560	49.41
C	STYRENE	58,154	106,476	-48,322	-45.38
C, P	BENZENE	46,020	198,926	-152,906	-76.87
C	ETHYLENE OXIDE	44,601	42,391	2,210	5.21
C	ACETONITRILE	41,655	69,924	-28,269	-40.43
C, P	1,2-DICHLOROETHANE	35,680	65,405	-29,725	-45.45
P	1,2,4-TRICHLOROBENZENE	31,563	141,538	-109,975	-77.70
P	1,2-DICHLOROPROPANE	23,795	34,115	-10,320	-30.25
P	ANTIMONY COMPOUNDS	23,644	20,747	2,897	13.96
P	NAPHTHALENE	20,837	26,001	-5,164	-19.86
C, P	TETRACHLOROETHYLENE	17,611	91,560	-73,949	-80.77
C	THIOUREA	16,951	16,090	861	5.35
P	ETHYLBENZENE	15,222	20,059	-4,837	-24.11
C, P	CARBON TETRACHLORIDE	15,117	10,483	4,634	44.20
P	DIBUTYL PHTHALATE	13,425	22,435	-9,010	-40.16
P	TRICHLOROETHYLENE	13,032	28,826	-15,794	-54.79
P	2,4-DINITROTOLUENE	12,055	11,270	785	6.97
P	1,2-DICHLOROBENZENE	11,844	19,220	-7,376	-38.38
P	DIETHYL PHTHALATE	11,272	1,220	10,052	823.93
C, P	ASBESTOS (FRIABLE)	10,449	19,879	-9,430	-47.44
P	ANTIMONY	8,927	36,489	-27,562	-75.54
P	NITROBENZENE	5,639	17,074	-11,435	-66.97
P	ARSENIC COMPOUNDS	5,355	10,469,081	-10,463,726	-99.95
C	HYDRAZINE	2,399	31,309	-28,910	-92.34
	TOTAL FOR ALL OTHER CARCINOGENS & PRIORITY POLLUTANTS	91,097	122,626	-31,529	-25.71
	SUBTOTAL	20,938,440	43,132,184	-22,193,744	-51.46
	GRAND TOTAL	343,213,761	385,194,629	-41,980,868	-10.90

* Carcinogens and priority pollutants reported with 1988 matched surface water discharges greater than 10,000 pounds and/or changes greater than 10,000 pounds.

**Ratings: C = Carcinogen; P = Priority Pollutant.

Geographical Distribution

Discharges to surface water in Louisiana—which were nearly three times those of any other state—decreased more than those of any other state from 1987 to 1988, dropping 19 percent from 192.8 to 155.9 million pounds. The net decrease stemmed from reductions at two facilities, Arcadian Corporation (Geismar) and a W. R. Grace and Company plant (Sulphur) which together reported decreases of 37.8 million pounds. Arcadian cut discharges of phosphoric acid and sulfuric acid, while most of W.R. Grace's reduction was of ammonium sulfate. Nine other states had decreases of over one million pounds. Overall, discharges decreased in 36 jurisdictions, decreased in 15, and remained the same in two. (See Figure 8-14, Table 8-7 and Table 8-B, at end of chapter.)

Louisiana facilities reduced discharges to surface water by 1/5 (37 million pounds) . . .

Facilities in Florida appear to have increased their surface water discharges from 19.3 million pounds to 55.7 million pounds. However, corrections to the database after analyses for this report were complete subtracted 48.6 million from the state total, which actually results in a net decrease of 12.1 million pounds for the state (see Box 3-C). Thus, surface water discharges increased by more than one million pounds in just three states: Washington state facilities generated an increase of 2.6 million pounds (54 percent); discharges in Arkansas increased by 1.5 million pounds (29 percent); and facilities in Virginia added 1.1 million pounds (six percent).

. . . while facilities in only 3 states generated net increases of more than 1 million pounds.

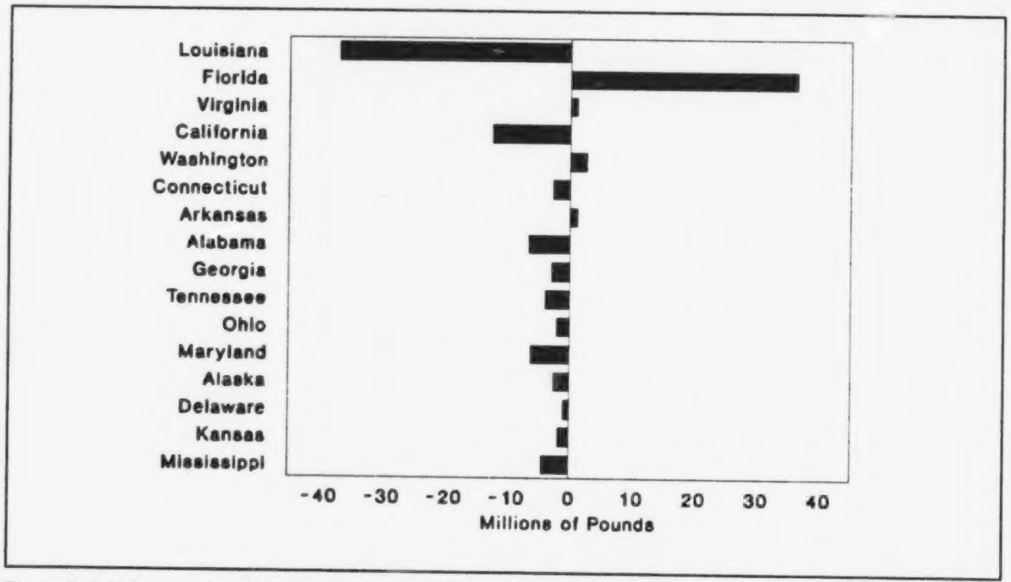


Figure 8-14. States with the Greatest Changes in TRI Matched Discharges to Surface Water, 1988. States shown in descending order by 1988 total discharges to surface water.

Industrial Distribution

The Chemical industry reported greater decreases in surface water discharges than all other industries combined . . .

The Chemical industry, which generated the largest matched chemical discharges to surface water for 1988, was principally responsible for the net decrease of 58.1 million pounds. Chemical industry discharges dropped 53.3 million pounds (21 percent), from 255.0 to 201.5 million pounds. Four other industries cut discharges by more than one million pounds: Primary Metals, Textiles, Petroleum, and Fabricated Metals. Each was a major contributor to surface water totals in both 1987 and 1988, ranking third, fifth, sixth, and eighth, respectively. The Apparel industry, which ranked 20th for 1987, cut discharges by 100 percent, dropping from 42,000 pounds in 1987 to zero in 1988. (See Figure 8-15 and Table 8-C, at end of Chapter.)

. . . largely due to decreases by just 4 facilities.

As with other distribution patterns, individual facilities predominated: four of the five facilities that reported the largest decreases to surface water were Chemical plants. Together, these facilities reduced their discharges by 52.7 million pounds, accounting for nearly all of the decrease for the industry. Arcadian Corporation diminished phosphoric acid and sulfuric acid discharges at its Geismar, Louisiana, plant by 21.0 million pounds. One W. R. Grace & Company facility (Sulphur, Louisiana) cut discharges by 16.8 million pounds (primarily ammonium sulfate), while a second W. R. Grace plant (Baltimore, Maryland) reported another 4.6 million pounds in reductions (again, primarily ammonium sulfate). The 10.4

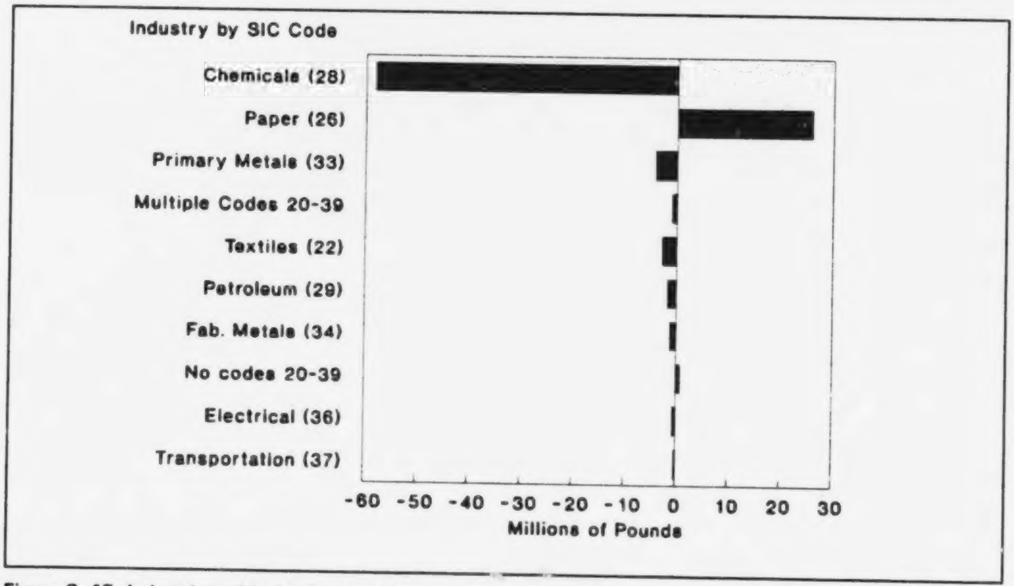


Figure 8-15. Industries with the Greatest Changes in TRI Matched Discharges to Surface Water, 1987-1988. Industries shown in descending order according to total 1988 discharges.

million-pound decrease in arsenic compounds by Kerr-McGee Chemical Corporation also contributed to the industry-wide decrease. (See Table 8-6.)

Despite net decreases, 10 industries reported increases in their discharges to surface water.

Despite the overall 11 percent decrease in surface water discharges of matched chemicals, ten industries reported increases. Paper manufacturing plants, which generated the second largest amount of discharges, appear to have reported the largest increases from 1987 to 1988; industry-wide discharges rose from 52.6 to 78.6 million pounds (49 percent). However, corrections to the TRI database after statistics for this report were compiled revised that number downward by 48.6 million pounds (See Box 3-C), resulting in a net decrease instead. Other increases were for relatively small amounts.

ON-SITE LAND DISPOSAL

Matched facilities reported a marked decrease in on-site land disposal . . .

Land disposal of matched chemicals decreased by 188.1 million pounds, or 29 percent. Only the decrease reported for off-site transfers exceeded that of land disposal (See Chapter 9). Despite this large decrease, on-site land disposal comprised approximately the same proportion of matched total releases and transfers in 1988 as in 1987 (11 percent).

. . . mostly due to decreases in land disposal of copper by Kennecott Utah Copper.

The decrease in land disposal was largely the result of dramatically reduced reporting of copper by Kennecott Utah Copper, a Primary Metals facility located in Bingham Canyon, Utah. This facility accounted for more than 80 percent of the decrease (146.5 million pounds), and affected every analysis of on-site land disposal. Copper became the chemical with the largest decrease; Utah became the state with the largest decrease; and Primary Metals became the industry with the largest decrease. Kennecott's reduction arises primarily from accounting changes (explained in Box 7-A). If land releases reported by Kennecott are not included in this analysis, on-site land releases would have been 482.6 million pounds in 1987 and 440.7 million pounds in 1988, a decrease of 41.9 million pounds (nine percent).

Chemical Distribution

Decreases in on-site land disposal of matched chemicals of greater than one million pounds were reported for 11 chemicals. In nearly every case, a large share of the net decrease came from just one or two facilities.

Land disposal of phosphoric acid dropped by 88 million pounds to nearly half the 1987 level.

For example, phosphoric acid disposal dropped 88.5 million pounds (48 percent), the second largest decrease after copper. Two Florida facilities—Royster Co. in Mulberry and Occidental Chemical Corp. in White Springs—cut land disposal of phosphoric acid by a total of 108.0 million pounds, outweighing a 14.6-million-pound increase by Chevron Chemical Co. (Rock Springs, Wyoming). Zinc compounds dropped 20.5 million pounds (21 percent); the decrease originated primarily at Kennecott Utah Copper and Wheeling Nissin Corp. (Follansbee, West Virginia), which together reported reductions of 12.5 million pounds. (See Figures 8-16 and 8-17 and Tables 8-8 and 8-9.)

Land disposal of manganese compounds more than doubled, from 30 to 77 million pounds.

Increases in on-site land disposal of greater than one million pounds were reported for eight chemicals. The greatest increase, 47.2 million pounds (156 percent) was reported for manganese compounds. Two facilities generated much of the increase: Inland Steel Co. (East Chicago, Indiana) reported an increase of 32.0 million pounds; and USS Fairless Works (Fairless Hills, Pennsylvania), increased 5.5 million pounds.

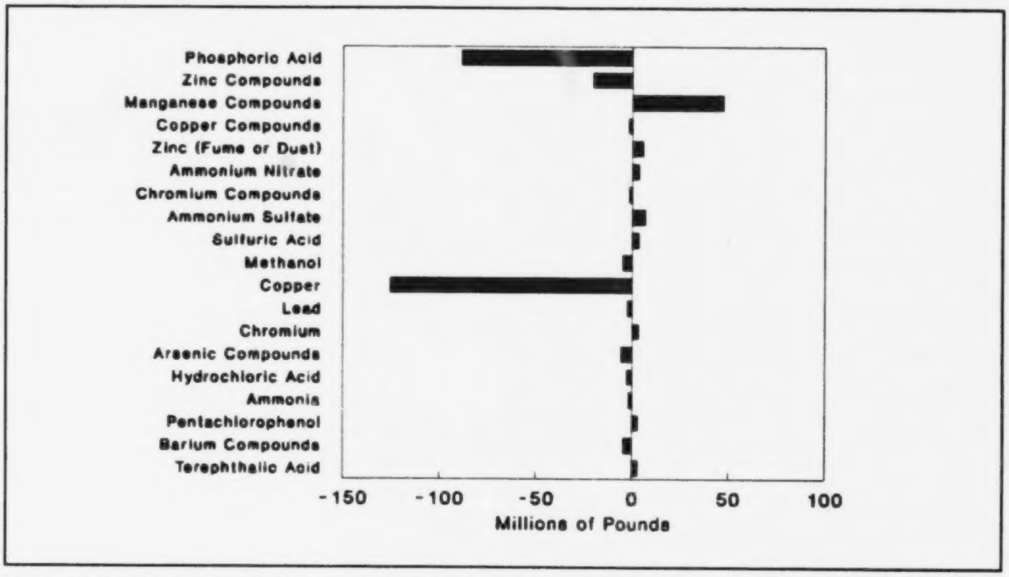


Figure 8-16. TRI Chemicals with the Greatest Changes in Matched On-Site Land Disposal, 1987-1988. Chemicals shown in descending order according to 1988 land disposal total.

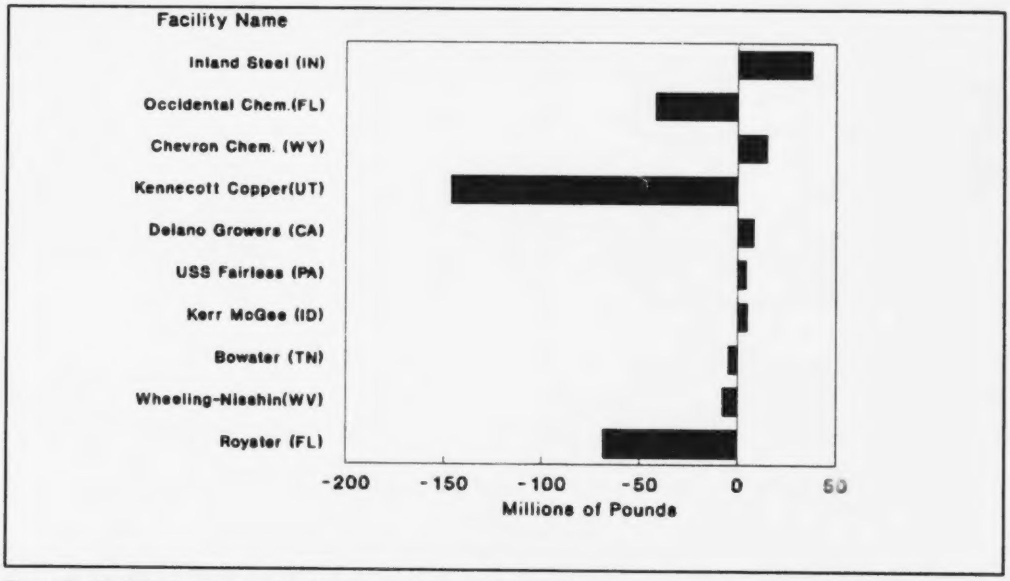


Figure 8-17. TRI Facilities with the Greatest Changes in Matched On-Site Land Disposal, 1987-1988. Facilities shown in descending order according to 1988 land disposal total.

Table 8-8. Changes in TRI On-site Land Disposal of Matched Chemicals,* 1987-1988.

CHEMICAL	1988 LAND Pounds	1987 LAND Pounds	1987-1988 CHANGE Pounds	Percent
PHOSPHORIC ACID	96,044,796	184,591,585	-88,546,789	-47.97
ZINC COMPOUNDS	78,080,624	98,607,987	-20,527,363	-20.82
MANGANESE COMPOUNDS	77,510,955	30,264,068	47,246,887	156.12
COPPER COMPOUNDS	20,536,529	22,552,681	-2,016,152	-8.94
ZINC (FUME OR DUST)	20,135,929	14,446,400	5,689,529	39.38
AMMONIUM NITRATE (SOLUTION)	16,578,614	13,075,798	3,502,816	26.79
CHROMIUM COMPOUNDS	15,847,614	17,741,721	-1,894,107	-10.68
AMMONIUM SULFATE (SOLUTION)	14,004,354	7,161,042	6,843,312	95.56
SULFURIC ACID	12,555,328	8,965,160	3,590,168	40.05
METHANOL	10,858,924	15,888,037	-5,029,113	-31.65
LEAD COMPOUNDS	10,462,467	11,125,129	-662,662	-5.96
COPPER	9,922,538	135,405,127	-125,482,589	-92.67
MANGANESE	9,019,327	9,469,507	-450,180	-4.75
LEAD	6,186,207	8,625,965	-2,439,758	-28.28
BARIUM	5,895,576	5,770,657	124,919	2.16
CHROMIUM	5,518,253	2,388,604	3,129,649	131.02
ARSENIC COMPOUNDS	5,375,683	11,045,215	-5,669,532	-51.33
HYDROCHLORIC ACID	3,829,054	6,739,857	-2,910,803	-43.19
PHOSPHORUS (YELLOW OR WHITE)	3,696,350	3,816,868	-120,518	-3.16
AMMONIA	3,042,893	4,804,460	-1,761,567	-36.67
PENTACHLOROPHENOL	3,002,215	34,916	2,967,299	8,498.39
BARIUM COMPOUNDS	2,874,435	7,518,687	-4,644,252	-61.77
TEREPHTHALIC ACID	2,792,409	10,500	2,781,909	26,494.37
NICKEL COMPOUNDS	2,265,553	2,036,285	229,268	11.26
ALUMINUM (FUME OR DUST)	2,103,728	2,628,599	-524,871	-19.97
ANTIMONY COMPOUNDS	1,924,970	2,055,845	-130,875	-6.37
PHENOL	1,735,351	1,041,774	693,577	66.58
NITRIC ACID	1,306,768	1,100,722	206,046	18.72
ASBESTOS (FRIABLE)	971,825	856,400	115,425	13.48
ANTIMONY	841,126	596,858	244,268	40.93
XYLENE (MIXED ISOMERS)	837,615	671,480	166,135	24.74
TOLUENE	817,561	1,748,157	-930,596	-53.23
ETHYLENE GLYCOL	774,103	683,383	90,720	13.28
NICKEL	594,751	663,335	-68,584	-10.34
FORMALDEHYDE	444,945	259,525	185,420	71.45
ACETONE	391,718	247,168	144,550	58.48
CHLORINE	326,985	1,085,413	-758,428	-69.87
CADMIUM COMPOUNDS	252,364	634,701	-382,337	-60.24
ETHYLBENZENE	251,253	105,429	145,824	138.31
STYRENE	227,787	320,016	-92,229	-28.82
BENZENE	220,611	207,581	13,030	6.28
ACETALDEHYDE	165,751	1	165,750	16,575,000.00
BIPHENYL	153,374	22,918	130,456	569.23
DICHLOROMETHANE	151,581	64,482	87,099	135.07
N-BUTYL ALCOHOL	145,722	434,974	-289,252	-66.50
METHYL ETHYL KETONE	110,538	45,500	65,038	142.94
NAPHTHALENE	109,092	135,109	-26,017	-19.26
METHYLENEBIS(PHENYLISOCYANATE)	83,836	82,975	861	1.04
GLYCOL ETHERS	83,260	26,732	56,528	211.46
SUBTOTAL	451,063,242	637,805,333	-186,742,091	-29.28
TOTAL FOR ALL OTHERS	1,453,970	2,846,868	-1,392,898	-0.09
GRAND TOTAL	452,517,212	640,652,201	-188,134,989	-29.37

* Chemicals with the largest matched land disposal for 1988.

Ammonium sulfate disposal rose by 7 million pounds (96%).

Land disposal of ammonium sulfate increased 6.8 million pounds (96 percent), the second largest increase of any chemical. Much of this increase originated at

Table 8-9. TRI Facilities with the Greatest Changes in Matched On-site Land Disposal, 1987-1988.

SIC CODE	FACILITY NAME	CITY, COUNTY, STATE	1987 ON-SITE LAND DISPOSAL		1988 ON-SITE LAND DISPOSAL		CHEMICALS WITH GREATEST CHANGE	
			Pounds	Percent*	Pounds	Percent*	Name	Pounds
THE FIVE FACILITIES WITH THE LARGEST DECREASES								
33	Kennecott Utah Copper	Bingham Canyon, Salt Lake, UT	158,357,750	99.80	11,828,750	94.44	Copper Arsenic Compounds	-125,899,750 -5,699,750
28	Royster Co.	Mulberry, Polk, FL	68,600,000	95.24	0	0.00	Phosphoric Acid Ammonia	-66,000,000 -2,600,000
28	Occidental Chemical Corp.	White Springs, Hamilton, FL	91,000,000	98.66	49,000,000	97.33	Phosphoric Acid	-42,000,000
**	Wheeling-Nisshin Inc.	Follansbee, Brooke, WV	8,056,945	71.79	346,900	9.73	Zinc compounds Nickel compounds	-8,000,000 -28,200
26	Bowater Inc.	Calhoun , McMinn, TN	5,688,177	83.23	1,112,000	48.32	Methanol Phenol	-4,580,000 -3,674
THE FIVE FACILITIES WITH THE LARGEST INCREASES								
M	Inland Steel Co.	East Chicago, Lake, IN	12,131,100	38.55	50,039,000	81.54	Manganese Compounds Zinc	32,000,000 4,356,000
28	Chevron Chemical Co.	Rock Springs, Sweetwater, WY	36,457	30.52	15,046,400	97.81	Phosphoric Acid Sulfuric acid	14,642,643 367,300
20	Delano Groc.Grape Prod.	Delano, Kern, CA	1,295,780	100.00	9,580,980	99.61	Sulfuric Acid Ammonium sulfate	8,224,685 60,515
28	Kerr McGee Vanadium	Soda Springs, Caribou, ID	4,000	1.86	5,022,691	95.05	Ammonium sulfate Chromium compounds	5,018,500 241
33	USS Fairless Works	Fairless Hills, Bucks, PA	4,643,000	52.44	9,000,020	78.53	Manganese Compounds	5,500,000

* Percent that land disposal comprises of the facility's matched releases and transfers.
** SIC Code 33 (Primary metals) in 1987, multiple SIC codes in 1988.
M = multiple SIC codes.

a Kerr-McGee Vanadium Facility (Soda Springs, Idaho), which added 5.0 million pounds of ammonium sulfate to 1987 disposal amounts.

In proportional terms, pentachlorophenol and terephthalic acid increases were especially marked. Land disposal of pentachlorophenol rose from 0.03 to 3.0 million pounds (8,000 percent), while terephthalic acid went from 0.01 to 2.8 million pounds (26,000 percent).

Chemical Classes

Land disposal decreased in every chemical class except halo-organics. Metals and metallic compounds, which comprised the largest share of chemicals disposed of on land for both 1987 and 1988, decreased by the greatest amount—102.5 million pounds (28 percent). The decrease is almost entirely due to the Kennecott Utah Copper facility described above. (See Figure 8-18 and Table 8-A, at end of chapter.)

Land disposal of metals/metallic compounds decreased more than any other chemical class.

Other metals and metal compounds for which sizeable decreases were reported were zinc compounds, barium compounds, lead, copper compounds, and chromium compounds. Decreases in these metals plus copper totaled 157.0 million pounds, but were partially offset by increases in on-site land disposal of other metals—mostly manganese compounds, zinc (fume or dust), and chromium—which totaled 56.1 million pounds. Increases in manganese compounds alone came to 47.2 million pounds. Thus, the net decrease in land disposal in this class was only 102.5 million pounds.

Land disposal of acids/bases/salts decreased by more than 1/3.

Acids/bases/salts decreased by 35 percent, compared to the 29-percent reduction for land disposal overall. Of all acids/bases/salts, phosphoric acid decreased the most, down 48 percent from the 184.6 million pound total in 1987. Royster Co. (Mulberry, Florida) and Occidental Chemical Corp. (White Springs, Florida) decreased land disposal of phosphoric acid by 66.0 and 42.0 million pounds, respectively. The large decrease of phosphoric acid was offset by increases in land disposal of ammonium sulfate, ammonium nitrate, and sulfuric acid. These compounds increased by 6.8, 3.5, and 3.5 million pounds, respectively.

Non-metallic inorganics decreased 38 percent, the largest proportional decrease of any class, dropping from 21.7 million pounds in 1987 to 13.5 million pounds in 1988. The bulk of the net decreases consisted of reductions of arsenic compounds and ammonia, which dropped by 5.7 and 1.8 million pounds, respectively. Kennecott Utah Copper reduced land disposal of arsenic compounds by 5.7 million pounds, and Royster Company reduced land disposal of ammonia by 2.6 million pounds.

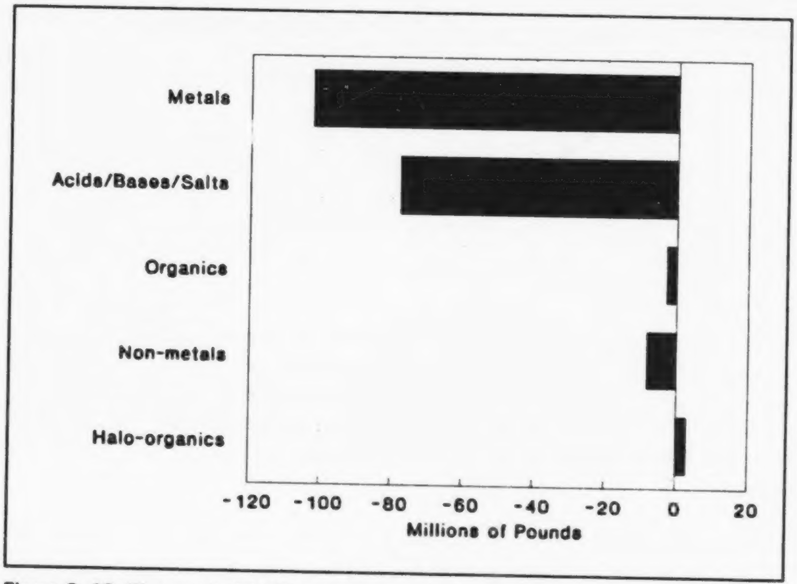


Figure 8-18. Changes in TRI Matched On-Site Land Disposal by Chemical Class, 1987-1988. Chemical classes shown in descending order according to 1988 land disposal totals.

Land disposal of halo-organics rose three million pounds. The increase was almost entirely due to a 3.0-million-pound increase of pentachlorophenol, which far exceeded the 100,000 pound decrease of the five halo-organics with large decreases (trichloroethylene, chlorobenzene, 1,1,1-trichloroethane, chloroform, 1,2,4-trichlorobenzene).

Halo-organics was the only class for which land disposal increased.

Carcinogens

Land disposal of carcinogens increased from 14.0 million pounds in 1987 to 14.6 million pounds in 1988. Carcinogens made up three percent of the total land disposal in each year; the proportion did not go up despite the increase.

Land disposal of carcinogens increased 5% . . .

Approximately half the increase in carcinogens consisted of chromium, for which land disposal increased 3.1 million pounds (131 percent), more than any other carcinogen. Inland Steel Company (East Chicago, Indiana) reported a 1.2-million-pound increase of chromium, accounting for a large share of the increase. Land disposal of each of 20 other carcinogens increased by 200,000 pounds or less. (See Figure 8-19 and Table 8-10.)

. . . and chromium played a leading role.

While land disposal of 21 carcinogens increased, others diminished. Lead dropped 2.4 million pounds, or 28 percent, with Kennecott Utah Copper, alone, decreasing land disposal of lead by 1.8 million pounds. Land disposal of the 21 other carcinogens decreased by 300,000 pounds or less.

Land disposal of lead diminished by 1/4.

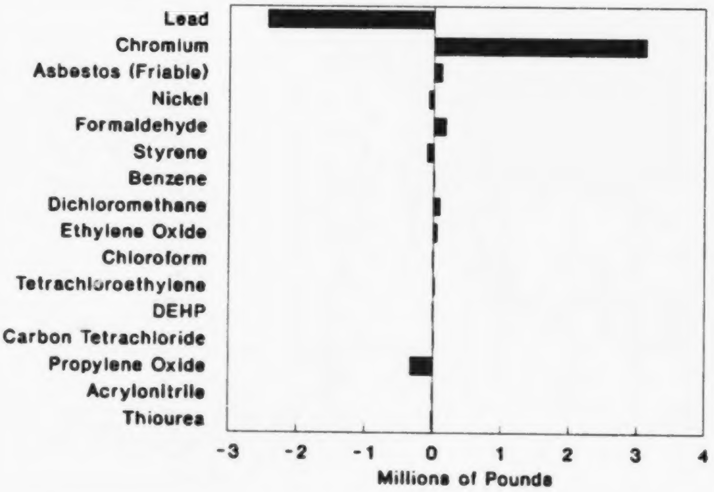


Figure 8-19. TRI Carcinogens with the Greatest Changes in Matched On-Site Land Disposal. Carcinogens shown in descending order according to 1988 land disposal totals.

Geographical Distribution

Utah had the largest reductions in land disposal, due to a reporting change by Kennecott Utah Copper.

Land disposal in Utah dropped from 164.0 to 13.5 million pounds (92 percent). Once again, the main factor was Kennecott Utah Copper: its 146.5-million-pound decrease shifted Utah from second place in 1987 (when it accounted for 26 percent of nationwide total for land disposal) to eleventh place in 1988 (when it accounted for only three percent). (See Figure 8-20 and Table 8-B, at end of Chapter.)

Table 8-10. Changes in Matched On-Site Land Disposal of TRI Carcinogens, 1987-1988.

CHEMICAL	1988 LAND Pounds	1987 LAND Pounds	1987-1988 CHANGE	
			Pounds	Percent
LEAD	6,186,207	8,625,965	-2,439,758	-28.28
CHROMIUM	5,518,253	2,388,604	3,129,649	131.02
ASBESTOS (FRIABLE)	971,825	856,400	115,425	13.48
NICKEL	594,751	663,335	-68,584	-10.34
FORMALDEHYDE	444,945	259,525	185,420	71.45
STYRENE	227,787	320,016	-92,229	-28.82
BENZENE	220,611	207,581	13,030	6.28
DICHLOROMETHANE	151,581	64,482	87,099	135.07
CADMIUM	71,045	72,116	-1,071	-1.49
ETHYLENE OXIDE	54,420	1,445	52,975	3,666.09
BERYLLIUM	37,000	27,870	9,130	32.76
CHLOROFORM	34,296	44,717	-10,421	-23.30
TETRACHLOROETHYLENE	29,491	3,970	25,521	642.85
DI-(2-ETHYLHEXYL) PHTHALATE	20,498	34,294	-13,796	-40.23
CARBON TETRACHLORIDE	14,746	3,134	11,612	370.52
ARSENIC	10,053	8,820	1,233	13.98
PROPYLENE OXIDE	9,680	336,353	-326,673	-97.12
1,3-BUTADIENE	7,812	4,496	3,316	73.75
NITRILOTRIACETIC ACID	6,800	4,300	2,500	58.14
O-TOLUIDINE	5,024	525	4,499	856.95
POLYCHLORINATED BIPHENYLS (PCBs)	2,702	250	2,452	980.80
VINYL CHLORIDE	2,180	733	1,447	197.41
1,2-DICHLOROETHANE	2,166	2,673	-507	-18.97
ACRYLONITRILE	1,825	14,948	-13,123	-87.79
ACETONITRILE	1,750	1,260	490	38.89
4,4'-METHYENEDIANILINE	1,140	2	1,138	56,900.00
1,4-DICHLOROBENZENE	1,050	740	310	41.89
TOLUENE-2,4-DIISOCYANATE	1,040	1,000	40	4.00
EPICHLOROHYDRIN	524	2,480	-1,956	-78.87
TOLUENE-2,6-DIISOCYANATE	510	1,000	-490	-49.00
ACRYLAMIDE	506	914	-408	-44.64
THIOUREA	500	16,500	-16,000	-96.97
P-CRESIDINE	500	1,678	-1,178	-70.20
DIAMINOTOLUENE (MIXED ISOMERS)	295	500	-205	-41.00
ETHYL ACRYLATE	265	1,013	-748	-73.84
1,2-DIBROMOETHANE	259	752	-493	-65.56
DIETHYL SULFATE	250	500	-250	-50.00
O-ANISIDINE	250	250	0	0.00
DIMETHYL SULFATE	50	0	50	—
HYDRAZINE	29	1,088	-1,059	-97.33
1,1,2,2-TETRACHLOROETHANE	29	10	19	190.00
1,3-DICHLOROPROPYLENE	0	490	-490	—
BIS(2-ETHYLHEXYL) ADIPATE	0	250	-250	—
SUBTOTAL	14,634,645	13,976,979	657,666	4.71
TOTAL FOR NONCARCINOGENS	437,882,567	635,675,222	-188,792,655	-17.44
GRAND TOTAL	452,517,212	649,652,201	-188,134,989	-12.73

Florida facilities, which reported the greatest amounts of land disposal in both 1987 and 1988, reported the second largest decreases—105.0 million pounds (58 percent). The Royster Company and Occidental Chemical Corporation together reduced land disposal of TRI chemicals by 110.6 million pounds, all of which was phosphoric acid and ammonia. (See Table 8-9.)

Land disposal decreased more in Florida than in any other state except Utah.

Indiana facilities reported the largest increases, from 23.0 to 62.9 million pounds (173 percent). The change originated largely from a 37.9-million-pound increase reported by Inland Steel Company (East Chicago, Indiana), mostly of manganese compounds. This increase shifted Indiana from the sixth-ranked state for land disposal for 1987 to the second-ranked for 1988.

The largest increases were reported in Indiana. . .

Wyoming manufacturers expanded land disposal by a factor of 40, reporting the second largest increase by weight, and by far the greatest in proportional terms: an increase from 400,000 to 15.2 million pounds (3,884 percent). Chevron Chemical Company (Rock Springs) figured prominently in the net increase, reporting increases of 15.0 million pounds, mostly phosphoric acid. This increase shifted Wyoming from 38th place in 1987 to ninth in 1988. New Hampshire facilities also reported a sizeable increase in proportional terms: land disposal in that state went from 0.1 to 3.1 million pounds—an increase of 2,318 percent.

. . . and Wyoming plants reported 1988 levels 40 times those reported in 1987.

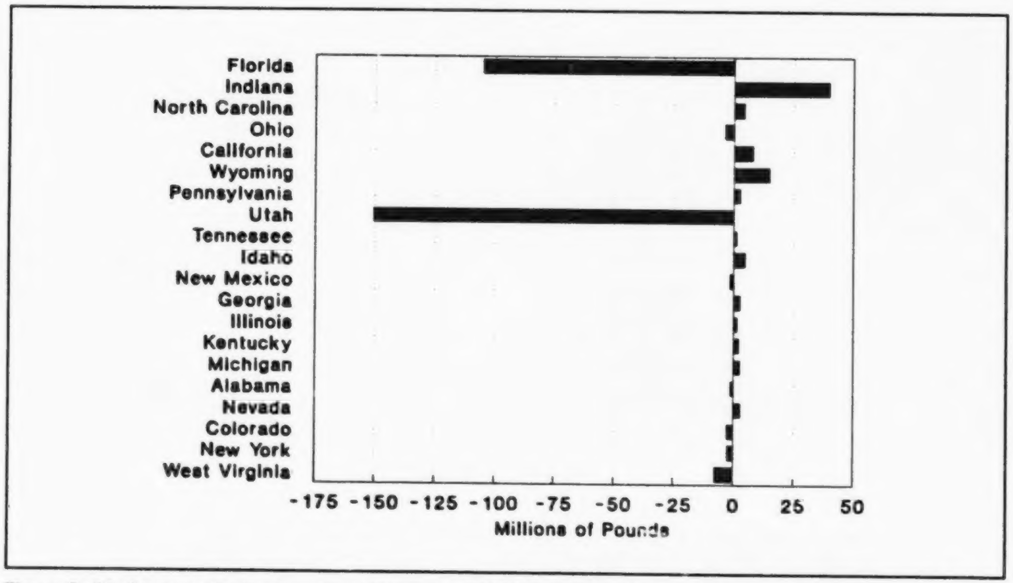


Figure 8-20. States with the Greatest Changes in TRI Matched On-site Land Disposal, 1987-1988. States shown in descending order according to 1988 land disposal totals.

Industrial Distribution

Decreases in the Primary Metals industry and the Chemical industry exceeded those in every other industry.

The Primary Metals and Chemical industries were responsible for the largest share of land disposal. However, the two industries accounted for a considerably smaller proportion of land releases in 1988 than in 1987—their share dropped from 91 to 78 percent. Land disposal by facilities in the Primary Metals industry accounted for 55 percent (351.9 million pounds) in 1987, but dropped to 44 percent (200.3 million pounds) for 1988. Facilities in the Chemical industry cut their share of the total from 36 to 34 percent, reducing land disposal from 231.8 to 154.8 million pounds. (See Figure 8-21 and Table 8-C, at end of Chapter.)

Land disposal for the Primary Metals facilities dropped 151.6 million pounds (43 percent), once again displaying the influence of the 146.5-million-pound decreases reported by Kennecott Utah Copper. Decreases for the Chemical industry—77.0 million pounds (33 percent)—originated at two Florida plants, Royster Co. and Occidental Chemical Corp., which together reported decreases amounting to 110.6 million pounds. These two decreases far outweighed the marked increases by Chevron Chemical Corp. (Wyoming) and Kerr McGee Vanadium (Idaho), which together reported increases of 20.0 million pounds.

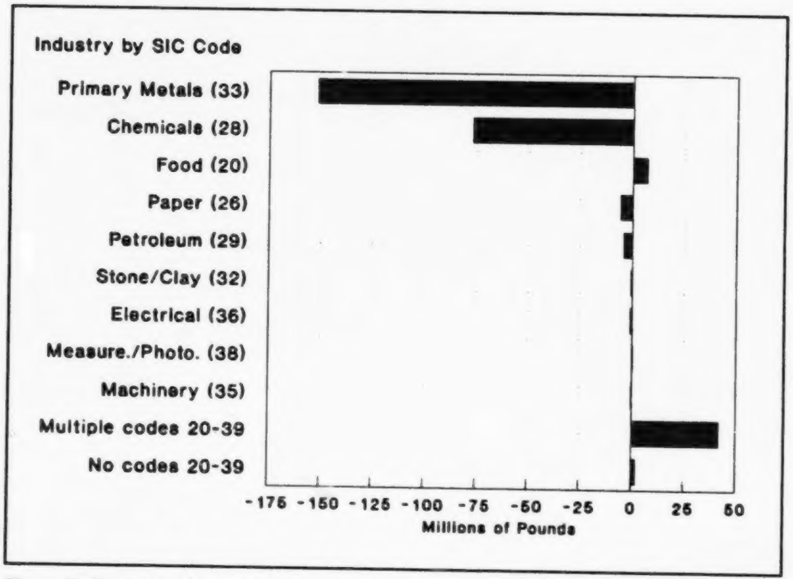
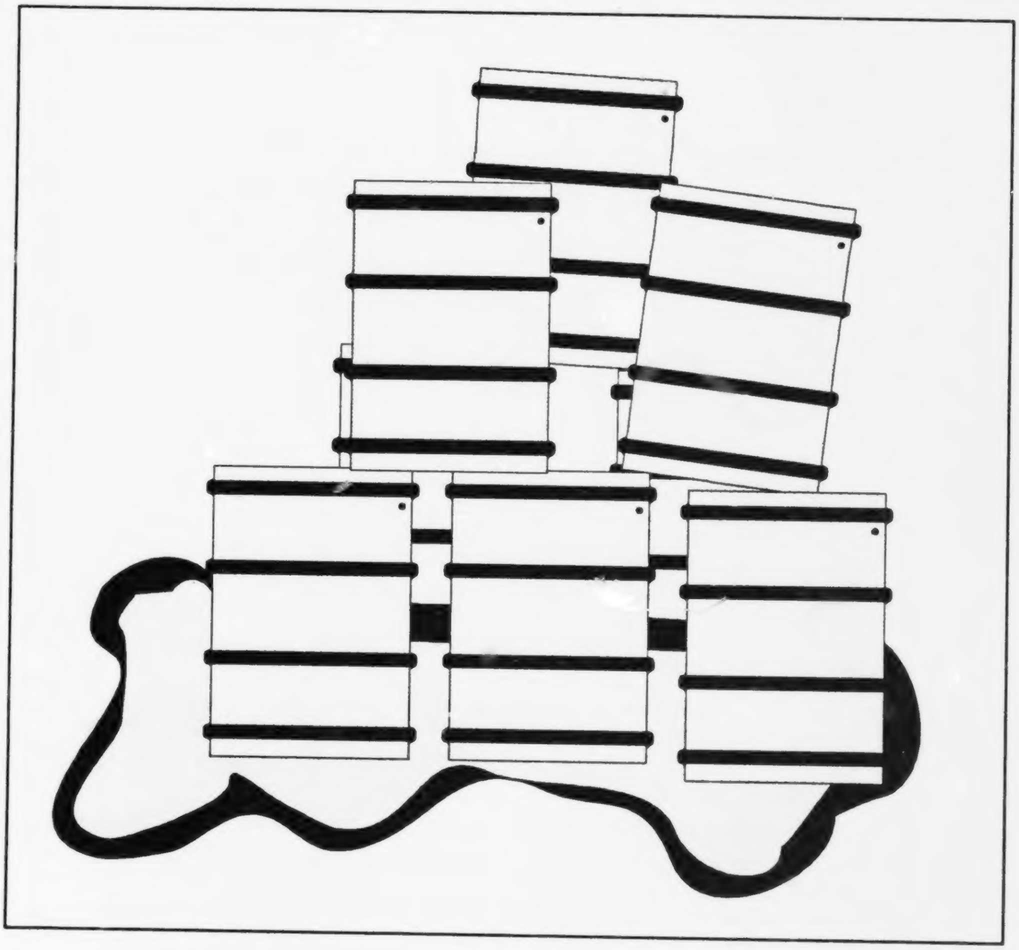


Figure 8-21. Industries with the Greatest Changes in TRI Matched On-site Land Disposal, 1987-1988. Industries shown in descending order according to 1988 land disposal totals.

Diversified facilities nearly tripled their land disposal with an increase of 42 million pounds.

Diversified facilities—those reporting multiple SIC codes—reported a 42.0 million-pound increase in matched land disposal. In 1987, they accounted for only four percent of total on-site land disposal (23.5 million pounds), but in 1988 they accounted for 14 percent (65.5 million pounds). The Inland Steel Co. (East Chicago, Indiana) reported multiple SIC codes, and was thus responsible for much of the increase, for it alone contributed 37.9 million pounds.

Food Products manufacturers increased land disposal by 7.1 million pounds. Delano Growers Grape Products (Delano, California) reported disposing of 8.3 million pounds more of matched chemicals on land in 1988 than in 1987, but this increase was partially offset by decreases elsewhere.



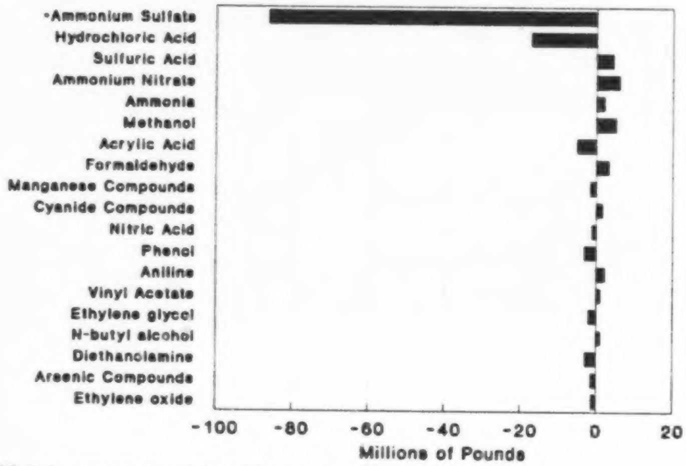
UNDERGROUND INJECTION

Underground injection remained a major disposal method for TRI chemicals in both 1987 and 1988, accounting for about 20 percent of matched total releases and transfers in each year. (See Figure 8-1.)

Chemical Distribution

Underground injection of 8 chemicals decreased by more than 1 million pounds.

Underground injection of eight chemicals decreased by more than one million pounds, including an apparent 86.1 million-pound decrease of ammonium sulfate—the largest reported for any chemical (See Box 3-C). Corrections to the TRI database after analyses for this report were completed added 100.0 million pounds to the total for the chemical, however, switching the largest apparent decrease into an increase of 13.9 million pounds. (See Figure 8-22 and Table 8-11.)



*1988 data correction adds 100M lbs. (see Box 3-C).

Figure 8-22. TRI Chemicals with the Greatest Changes in TRI Matched Underground Injection, 1987-1988. Chemicals shown in descending order according to 1988 underground injection totals.

Underground injection of hydrochloric acid dropped 17.2 million pounds.

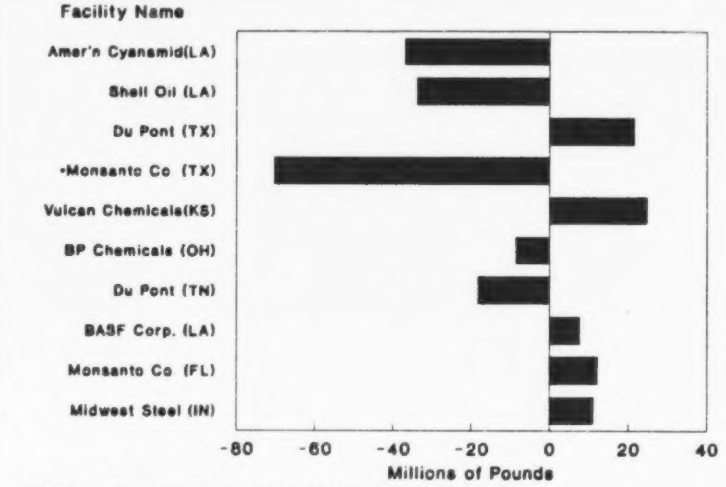
Hydrochloric acid decreased by four percent, from 413.2 million pounds in 1987 to 396.0 million pounds in 1988. Shell Oil Co. (Norco, Louisiana) and DuPont Johnsonville Plant (New Johnsonville, Tennessee) together cut their underground injections by 47.2 million pounds, which outweighed increases totaling 31.3

Table 8-11. Changes in TRI Injection to Underground Wells of Matched Chemicals,* 1987-1988.

CHEMICAL	1988 UNDER-GROUND Pounds	1987 UNDER-GROUND Pounds	1987-1988 CHANGE	
			Pounds	Percent
AMMONIUM SULFATE (SOLUTION)**	416,076,931	502,216,019	-86,139,088	-17.15
HYDROCHLORIC ACID	396,042,477	413,249,144	-17,206,667	-4.16
SULFURIC ACID	138,056,346	133,738,197	4,318,149	3.23
AMMONIUM NITRATE (SOLUTION)	64,641,000	58,565,000	6,076,000	10.37
AMMONIA	49,031,646	47,016,070	2,015,576	4.29
METHANOL	23,545,120	18,477,387	5,067,733	27.43
ACRYLIC ACID	22,262,010	27,264,250	-5,002,240	-18.35
ACETONITRILE	16,652,800	15,962,292	690,508	4.33
FORMALDEHYDE	9,348,274	6,089,150	3,259,124	53.52
MANGANESE COMPOUNDS	6,810,250	8,500,550	-1,690,300	-19.88
CYANIDE COMPOUNDS	5,711,281	4,047,763	1,663,518	41.10
NITRIC ACID	4,647,860	5,698,912	-1,051,052	-18.44
PHENOL	4,568,523	7,657,968	-3,089,445	-40.34
ACRYLONITRILE	4,562,705	4,237,962	324,743	7.66
ANILINE	3,582,975	1,280,878	2,302,097	179.73
VINYL ACETATE	3,211,259	2,109,378	1,101,881	52.24
ACETONE	2,946,461	2,256,693	689,768	30.57
ETHYLENE GLYCOL	2,883,434	4,812,603	-1,929,169	-40.09
ACETALDEHYDE	2,505,109	1,568,090	937,019	59.76
HYDROGEN CYANIDE	1,699,650	979,650	720,000	73.50
TOLUENE	1,390,416	1,512,494	-122,078	-8.07
N-BUTYL ALCOHOL	1,306,660	210,984	1,095,676	519.32
1,2-DICHLOROETHANE	1,222,484	1,051,494	170,990	16.26
PROPYLENE OXIDE	1,113,780	120,000	993,780	828.15
ACRYLAMIDE	879,000	918,000	-39,000	-4.25
NITROBENZENE	819,024	561,000	258,024	45.99
CRESOL (MIXED ISOMERS)	719,437	1,295,345	-575,908	-44.46
TERT-BUTYL ALCOHOL	674,798	363,379	311,419	85.70
BENZENE	627,774	393,072	234,702	59.71
HYDROGEN FLUORIDE	560,250	583,000	-22,750	-3.90
CYCLOHEXANE	477,951	331,942	146,009	43.99
4,4'-METHYENEDIANILINE	460,000	456,000	4,000	0.88
HYDROQUINONE	375,400	402,050	-26,650	-6.63
CUMENE HYDROPEROXIDE	371,000	63,000	308,000	488.89
GLYCOL ETHERS	357,823	200,000	157,823	78.91
HYDRAZINE SULFATE	355,000	139,000	216,000	155.40
DIBUTYL PHTHALATE	350,000	270,000	80,000	29.63
METHYL METHACRYLATE	327,221	227,300	99,921	43.96
DICHLOROMETHANE	312,750	482,750	-170,000	-35.21
2-NITROPROPANE	257,000	167,501	89,499	53.43
PYRIDINE	256,250	303,650	-47,400	-15.61
MALEIC ANHYDRIDE	240,000	250	239,750	95,900.00
DIETHANOLAMINE	227,000	3,159,500	-2,932,500	-92.82
MOLYBDENUM TRIOXIDE	195,865	0	195,865	—
CHLOROMETHANE	165,250	132,050	33,200	25.14
P-CRESOL	152,000	96,000	56,000	58.33
ZINC (FUME OR DUST)	140,010	131,750	8,260	6.27
BENZOYL CHLORIDE	130,000	130,000	0	0.00
NICKEL COMPOUNDS	122,820	335,684	-212,864	-63.41
METHYL ISOBUTYL KETONE	116,650	60,450	56,200	92.97
COPPER COMPOUNDS	115,535	78,421	37,114	47.33
XYLENE (MIXED ISOMERS)	114,727	586,501	-471,774	-80.44
CHLORINE	107,624	82,951	24,673	29.74
2,4-DINITROTOLUENE	106,400	203,000	-96,600	-47.59
TOTAL	1,193,934,010	1,280,776,474	-86,842,464	-6.78
TOTAL FOR ALL OTHERS	1,454,272	4,849,203	-3,394,931	-70.01
GRAND TOTAL	1,195,388,282	1,285,625,677	-90,237,395	-7.02

* Chemicals with the largest matched underground injection for 1988.

** 1988 data corrections add 100.0 million pounds.



•1988 data correction adds 90 M lbs (see Box 3-C).

Figure 8-23. TRI Facilities with the Greatest Changes in TRI Matched Underground Injection, 1987-1988. Facilities shown in descending order according to 1988 underground injection totals.

Table 8-12. TRI Facilities with the Greatest Changes in Matched Injection to Underground Wells, 1987-1988.

SIC CODE	FACILITY NAME	CITY, COUNTY, STATE	1987 UNDERGROUND		1988 UNDERGROUND		GREATEST CHANGE	
			Pounds	Percent*	Pounds	Percent*	Name	Pounds
THE FIVE FACILITIES WITH THE LARGEST DECREASES								
28	Monsanto Co.**	Alvin, Brazoria, TX	172,985,200	98.48	102,787,500	99.47	Ammonium sulfate Formaldehyde	-70,000,000 -400,000
28	American Cyanamid Co.	Westwego, Jefferson, LA	212,092,250	99.37	175,176,250	99.30	Ammonium sulfate Sulfuric acid	-36,000,000 -2,700,000
M	Shell Oil Co. - Norco Mfg.	Norco, St. Charles, LA	190,313,000	97.98	156,363,300	98.55	Hydrochloric Acid Diethanolamine	-29,200,000 -2,967,000
28	Du Pont Johnsonville Plant	New Johnsonville, Humphreys, TN	62,200,000	85.82	44,000,000	83.50	Hydrochloric Acid Manganese compounds	-16,000,000 -2,200,000
28	BP Chemicals Inc.	Lima, Allen, OH	58,587,250	86.93	50,010,250	86.60	Acrylic Acid Ammonium sulfate	-6,600,000 -3,000,000
THE FIVE FACILITIES WITH THE LARGEST INCREASES								
28	Vulcan Chemicals	Wichita, Sedgwick, KS	65,942,760	98.00	90,717,910	98.59	Hydrochloric Acid Methanol	23,700,000 894,000
28	Du Pont Beaumont Works***	Beaumont, Jefferson, TX	81,900,150	95.82	103,545,540	92.53	Ammonium sulfate Hydrogen cyanide	21,000,000 600,000
28	Monsanto Co	Cantonment, Escambia, FL	22,397,400	93.75	34,478,262	95.11	Ammonium sulfate Dibutyl phthalate	12,000,000 80,000
33	Midwest Steel Corp	Portage, Porter, IN	15,983,340	92.21	27,077,730	92.09	Sulfuric Acid Chromium compounds	11,091,911 2,382
28	BASF Corp.	Geismar, Ascension, LA	27,983,300	93.65	35,550,965	95.40	Hydrochloric Acid	7,567,970

*Percent thant undergreound injection comprises of the facility's matched releases and transfers.

** Corrections to the data add 90,000 pounds to 1988 underground (see Box 3-C).

*** Corrections to the data add 10,000,000 pounds to 1988 underground (see Box 3-C).

M = multiple SIC codes.

million pounds reported by Vulcan Chemicals (Wichita, Kansas) and BASF Corp. (Geismar, Louisiana). Hydrochloric acid remained the second-ranked chemical in 1988, making up one third (396.0 million pounds) of the total underground injection of matched chemicals. (See Figure 8-23 and Table 8-12.)

Underground injection of nine chemicals increased by more than one million pounds. Ammonium nitrate increased the most, rising from 58.6 million pounds in 1987 to 64.6 million pounds in 1988 (ten percent). Monsanto Company (Cantonment, Florida) contributed nearly all of the increase, expanding underground injection of ammonium nitrate by 12.0 million pounds. Methanol increased 27 percent, from 18.5 to 23.5 million pounds, with increases by various facilities.

Ammonium nitrate and methanol increased by 6 and 5 million pounds, respectively.

Chemical Classes

Underground injection of the classes acids/bases/salts, halo-organics, and metals/metallic compounds decreased in 1988. Acids/bases/salts, which accounted for the largest share of the total, decreased the most, from 1.1 to 1.0 billion pounds (However, see Box 3-C concerning corrections to the data in this category.) (eight percent). (See Figure 8-24 and Table 8-A, at end of Chapter.)

Acids/bases/salts dropped 8%; . . .

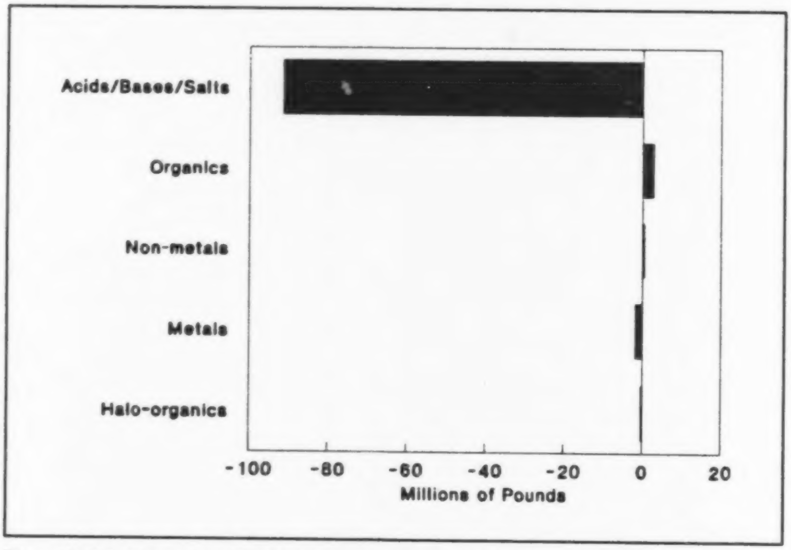


Figure 8-24. Changes in TRI Matched Underground Injection by Chemical Class, 1987-1988. Chemical classes shown in descending order according to 1988 underground injection totals.

Table 8-13. Changes for Matched Chemicals in Underground Injection of TRI Carcinogens, 1987-1988.

CHEMICAL	1988 UNDERGROUND Pounds	1987 UNDERGROUND Pounds	1987-1988 CHANGE Pounds	Percent
ETHYLENE OXIDE	11,125	1,205,323	-1,194,198	-99.08
TETRACHLOROETHYLENE	72,250	354,000	-281,750	-79.59
DICHLOROMETHANE	312,750	482,750	-170,000	-35.21
ASBESTOS (FRIABLE)	94,800	252,000	-157,200	-62.38
CARBON TETRACHLORIDE	98,054	211,000	-112,946	-53.53
CHLOROFORM	36,002	80,500	-44,498	-55.28
ACRYLAMIDE	879,000	918,000	-39,000	-4.25
EPICHLOROHYDRIN	68,300	73,000	-4,700	-6.44
1,4-DICHLOROBENZENE	15,000	19,000	-4,000	-21.05
2,4,6-TRICHLOROPHENOL	12,000	15,500	-3,500	-22.58
VINYL CHLORIDE	53	700	-647	-92.43
LEAD	0	500	-500	—
CHROMIUM	330	640	-310	-48.44
TOLUENE-2,6-DIISOCYANATE	0	250	-250	—
POLYCHLORINATED BIPHENYLS (PCBs)	0	250	-250	—
4-AMINOAZOBENZENE	537	693	-156	-22.51
HEXACHLOROBENZENE	410	522	-112	-21.46
STYRENE	165	250	-85	-34.00
4-AMINOBIPHENYL	4	6	-2	-33.33
O-TOLUIDINE	250	250	0	0.00
P-NITROSODIPHENYLAMINE	2,000	2,000	0	0.00
METHYL IODIDE	250	55	195	354.55
THIOUREA	5,940	5,400	540	10.00
DI-(2-ETHYLHEXYL) PHTHALATE	3,091	500	2,591	518.20
NICKEL	9,855	5,913	3,942	66.67
4,4'-METHYENEDIANILINE	460,000	456,000	4,000	0.88
1,3-DICHLOROPROPYLENE	5,000	0	5,000	—
1,2-DIBROMOETHANE	6,882	44	6,838	15,540.91
2-NITROPROPANE	257,000	167,501	89,499	53.43
1,2-DICHLOROETHANE	1,222,484	1,051,494	170,990	16.26
BENZENE	627,774	393,072	234,702	59.71
ACRYLONITRILE	4,562,705	4,237,962	324,743	7.66
ACETONITRILE	16,652,800	15,962,292	690,508	4.33
PROPYLENE OXIDE	1,113,780	120,000	993,780	828.15
FORMALDEHYDE	9,348,274	6,089,150	3,259,124	53.52
SUBTOTAL	35,878,865	32,106,517	3,772,348	11.75
TOTAL FOR NONCARCINOGENS	1,159,509,417	1,253,519,153	-94,009,736	-18.77
GRAND TOTAL	1,195,388,282	1,285,625,670	-90,237,388	-7.02

. . . metallic compounds and halo-organics also decreased.

Metals and metallic compounds decreased 1.7 million pounds (18 percent), the next largest decrease. However, since this accounted for less than one percent of total underground injections in 1987 and 1988, this decrease has little impact on total underground injection.

Underground injection of the organics and non-metallic inorganics classes increased.

Underground injection of organics increased by 2.8 million pounds (three percent), and non-metallic inorganics increased by 0.4 million pounds or one percent. Both classes, however, account for less than ten percent of total underground injections each year, so these increases had little impact on total underground injection.

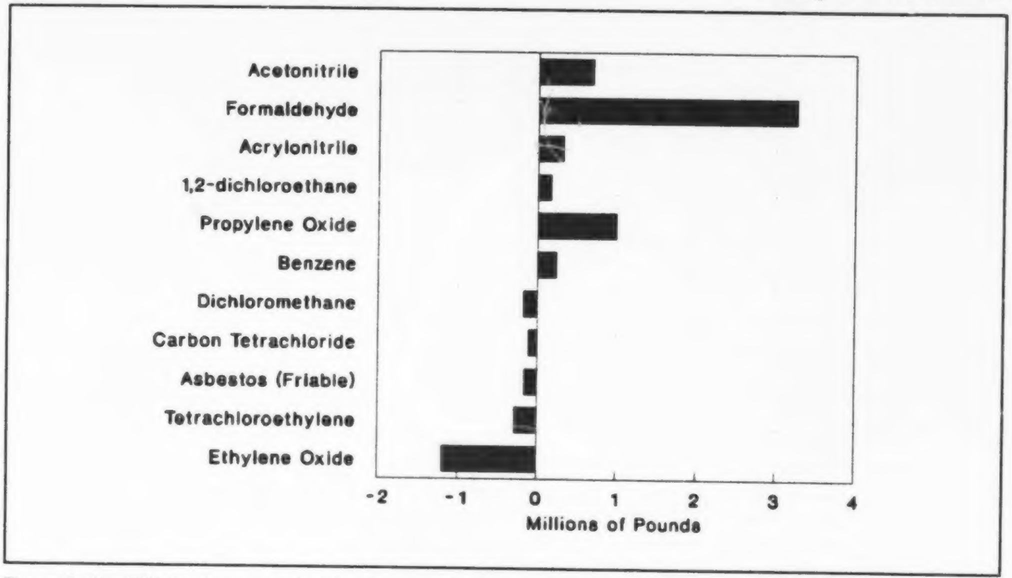


Figure 8-25. TRI Carcinogens with the Greatest Changes in TRI Matched Underground Injection, 1987-1988. Carcinogens shown in descending order according to 1988 underground injection totals.

Carcinogens

Underground injection of carcinogens increased by 12%.

Despite the net decrease in underground injection, carcinogens increased, going from 32.1 to 35.9 million pounds (3.8 million pounds, 12 percent). Injection increased for 14 carcinogens, remained the same for two, and decreased for 19. Formaldehyde alone increased 3.3 million pounds, from 6.1 to 9.4 million pounds (54 percent), outweighing a 1.2-million-pound reduction of ethylene oxide. (See Figure 8-25 and Table 8-13.)

Geographical Distribution

Underground injection decreased more in Louisiana than in any other state . . .

Louisiana facilities reported the largest total amounts of underground injection in both 1987 and 1988, and likewise reported the largest decreases. The statewide total dropped from 484.7 million pounds in 1987 to 423.3 million pounds in 1988 (61.4 million pounds, or 13 percent). The reduction was accomplished primarily by American Cyanamid Co. (Westwego) and Shell Oil Co. (Norco), which together reported decreases totaling 70.9 million pounds. Another Louisiana facility, BASF Corp. (Geismar), offset a portion of this decrease with an increase of 7.6 million pounds. (See Figure 8-26 and Table 8-B, at end of Chapter.)

. . . while Kansas facilities generated the largest increases.

In contrast, Kansas facilities reported increasing matched underground injections from 66.0 to 90.7 million pounds (38 percent). Vulcan Chemicals (Wichita) added 24.8 million pounds to 1987 levels, accounting for much of the statewide increase. Florida facilities increased their matched underground injections by fewer pounds

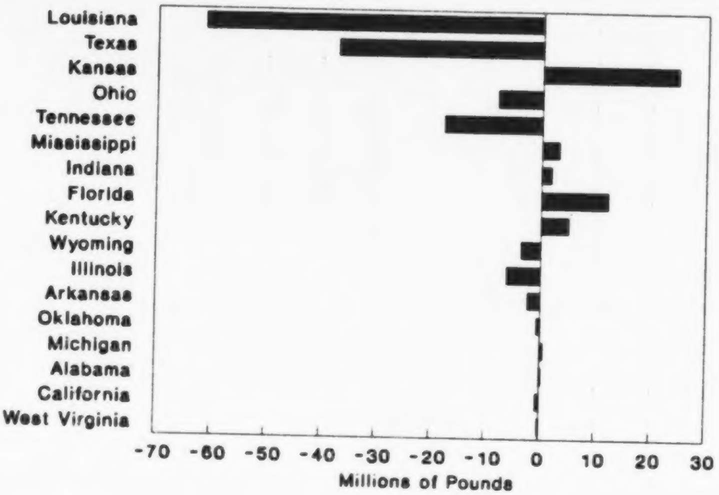


Figure 8-26. States with the Greatest Changes in TRI Matched Underground Injection, 1987-1988. States shown in descending order according to 1988 underground injection totals.

(12.1 million) but by a larger percentage (53 percent). The Monsanto Company facility (Cantonment, Florida) contributed more than 90 percent of that increase (12.1 million pounds).

Industrial Distribution

The Chemical industry reported the largest decreases in underground injection . . .

Facilities in the Chemical industry, which produced the largest underground injection totals for both 1987 and 1988, also contributed the greatest reductions. The industry cut underground injection from 1.0 billion pounds in 1987 to 954.1 million pounds in 1988 (six percent), but because other industries decreased by even larger percentages, the Chemical industry's share actually increased somewhat in proportional terms.[3] (See Figure 8-27 and Table 8-C, at end of Chapter.)

Diversified facilities—those reporting multiple SIC codes—contributed a large share of the underground injection total, and reported the second greatest decrease (43.1 million pounds, 20 percent), decreasing from 215.7 to 172.7 million percent. A single diversified facility in Louisiana—Shell Oil Co. (Norco)—decreased underground injection by 33.9 million pounds.

(3) Two facilities affected by 1988 data corrections belong to the Chemical industry; taking the corrections into account transforms the apparent decrease for the industry into an increase of over 50 million pounds. (See Box 3-C.)

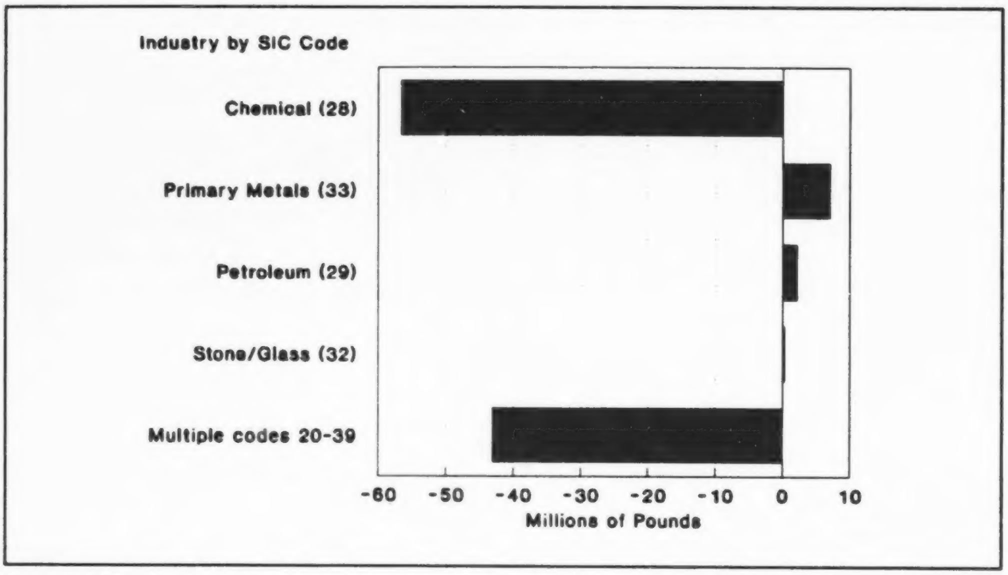


Figure 8-27. Industries with the Greatest Changes in TRI Matched Underground Injection, 1987-1988. Industries shown in descending order according to 1988 underground injection totals.

. . . while the Primary Metals industry reported increases over 1987 levels.

Primary Metals plants generated three percent of the underground injection total for 1987 and 1988, reporting an increase of 7.0 million pounds (21 percent). Midwest Steel Corp. (Portage, Indiana) produced most of the increase, expanding underground injection by 11.1 million pounds in 1988 (mostly of sulfuric acid), which was partially offset by decreases at other facilities.

Table 8-A. Changes in TRI Matched Releases by Chemical Class, 1987-1988.

CHEMICAL CLASS	AIR EMISSIONS				SURFACE WATER EMISSIONS			
	1988	1987	CHANGE		1988	1987	CHANGE	
	Pounds	Pounds	Pounds	Percent	Pounds	Pounds	Pounds	Percent
Acids/Bases/Salts	95,025,578	107,987,623	-12,962,045	-12.00	287,792,344	295,717,104	-7,924,760	-2.68
Halo-organics	415,273,010	436,614,296	-21,341,286	-4.89	1,772,532	2,280,446	-507,914	-22.27
Metals	19,530,390	22,522,335	-2,991,945	-13.28	3,092,229	4,565,894	-1,473,665	-32.28
Non-metals	378,008,846	383,503,218	-5,494,372	-1.43	26,480,756	45,660,460	-19,179,704	-42.01
Organics	1,264,457,614	1,403,246,416	-138,788,802	-9.89	24,048,900	36,970,725	-12,921,825	-34.95
Mixtures	323,372	306,973	16,399	5.34	27,000	0	27,000	—
Trade Secrets	20,218	16,653	3,565	21.41	0	0	0	—
TOTAL	2,172,639,028	2,354,197,514	-181,558,486	-7.71	343,213,761	385,194,629	-41,980,868	-10.90

TABLE 8-C. Changes in TRI Matched Releases by Industry, 1987-1988.

SIC CODE	INDUSTRY	AIR EMISSIONS				SURFACE WATER DISCHARGES			
		1988	1987	CHANGE		1988	1987	CHANGE	
		Pounds	Pounds	Pounds	Percent	Pounds	Pounds	Pounds	Percent
20	Food Products	9,676,428	12,905,500	-3,229,072	-25.02	2,593,257	2,542,297	50,960	2.00
21	Tobacco Manufacturers	13,727,377	5,390,428	8,336,949	-54.66	118,812	134,850	-16,038	-11.89
22	Textile Mill Products	31,466,822	35,853,260	-4,386,438	-12.23	4,500,157	7,223,949	-2,723,792	-37.71
23	Apparel	626,250	1,992,857	-1,366,607	-68.58	0	42,810	-42,810	-100.00
24	Lumber/ Wood Products	20,248,026	21,597,670	-1,349,644	-6.25	68,817	53,253	15,564	29.23
25	Furniture and Fixtures	42,615,430	44,309,562	-1,694,132	-3.82	1,600	41,661	40,061	96.16
26	Paper Products	178,032,473	215,918,707	-37,886,234	-17.55	78,568,002	52,584,444	25,983,558	49.41
27	Printing, Publishing	41,851,648	47,791,141	-5,939,493	-12.43	2,740	424	2,316	546.23
28	Chemical Products	724,358,875	856,406,293	-132,047,418	-15.42	223,990,442	282,102,178	-58,111,736	-20.60
29	Petroleum Refining	53,085,562	62,379,183	-9,293,621	-14.90	3,178,802	4,755,535	-1,576,733	33.16
30	Rubber / Plastic Products	134,168,450	128,791,036	5,377,414	4.18	276,542	251,061	25,481	10.15
31	Leather Products	11,115,165	13,399,941	-2,284,776	17.05	580,232	398,744	181,488	45.51
32	Stone, Clay, Glass Products	19,693,614	22,383,504	-2,689,890	-12.02	519,631	442,938	76,693	17.31
33	Primary Metals	214,811,117	189,040,203	25,770,914	13.63	17,646,768	21,782,119	-4,135,351	-18.99
34	Fabricated Metals	93,710,870	95,921,605	-2,210,735	-2.30	1,380,624	2,528,619	-1,147,995	-45.40
35	Machinery, except Electrical	41,933,227	41,699,809	233,418	0.56	286,271	184,008	102,263	55.58
36	Electric and Electronic Equip.	98,979,793	106,259,100	-7,279,307	-6.85	550,923	1,004,696	453,773	-45.17
37	Transportation Equipment	168,342,338	185,532,517	-17,190,179	-9.27	184,549	436,116	-251,567	-57.68
38	Measuring, Photographic Goods	41,650,684	47,474,313	-5,823,629	-12.27	684,211	462,564	221,647	47.92
39	Misc. Manufacturing	20,342,303	22,688,496	-2,346,193	-10.34	51,986	161,880	-109,894	-67.89
	Multiple SIC codes in 20 - 39	203,713,541	185,842,010	17,871,531	9.62	6,915,811	7,794,004	-878,193	-11.27
	No SIC codes in 20 - 39	8,489,035	10,620,379	-2,131,344	-20.07	1,113,584	266,479	847,105	317.89
	TOTAL	2,172,639,028	2,354,197,514	-181,558,486	-7.71	343,213,761	385,194,629	-41,980,868	-10.90

Table 8-A, continued.

CHEMICAL CLASS	ON-SITE LAND DISPOSAL				UNDERGROUND INJECTION			
	1988 Pounds	1987 Pounds	CHANGE Pounds	CHANGE Percent	1988 Pounds	1987 Pounds	CHANGE Pounds	CHANGE Percent
Acids/Bases/Salts	144,391,139	222,200,907	-77,809,768	-35.02	1,027,845,505	1,119,273,830	-91,428,325	-8.17
Halo-organics	3,407,886	417,216	2,990,670	716.82	2,461,756	2,796,803	-335,047	-11.98
Metals	270,263,641	372,780,505	-102,516,864	-27.50	7,498,853	9,179,359	-1,680,506	-18.31
Non-metals	13,472,576	21,703,811	-8,231,235	-37.93	49,264,870	48,810,056	454,814	0.93
Organics	20,981,720	23,849,012	-2,867,292	-12.02	108,317,298	105,565,622	2,751,676	2.61
Mixtures	250	750	-500	-66.67	0	0	0	0.00
Trade Secrets	0	0	0	0.00	0	0	0	0.00
TOTAL	452,517,212	640,962,201	-188,444,989	-29.40	1,195,388,282	1,285,625,670	-90,237,388	-7.02

TABLE 8-C, continued.

SIC CODE	INDUSTRY	ON-SITE LAND DISPOSAL				UNDERGROUND INJECTION			
		1988 Pounds	1987 Pounds	CHANGE Pounds	CHANGE Percent	1988 Pounds	1987 Pounds	CHANGE Pounds	CHANGE Percent
20	Food Products	11,213,892	4,094,519	7,119,373	173.88	1,017,909	998,660	19,249	1.93
21	Tobacco Manufacturers	14,251	69	14,182	20553.62	0	0	0	—
22	Textile Mill Products	184,331	150,250	34,081	22.68	0	0	0	—
23	Apparel	0	0	0	—	0	0	0	—
24	Lumber /Wood Products	34,036	83,570	-49,534	-59.27	0	0	0	—
25	Furniture and Fixtures	41,896	22,908	18,988	82.89	0	0	0	—
26	Paper Products	8,370,617	13,994,979	-5,624,362	-40.19	0	30,144	-30,144	—
27	Printing, Publishing	313	253	60	23.72	0	0	0	—
28	Chemical Products	154,809,405	231,791,765	-76,982,360	-33.21	954,058,132	1,010,651,600	-56,593,468	-5.60
29	Petroleum Refining	2,874,352	6,982,268	-4,107,916	-58.83	19,846,879	17,662,132	2,184,747	12.37
30	Rubber / Plastic Products	116,435	149,272	-32,837	-22.00	3,000	35,250	-32,250	-91.49
31	Leather Products	17,704	58,468	-40,764	-69.72	0	0	0	—
32	Stone, Clay, Glass Products	1,781,433	2,265,326	-483,893	-21.36	6,580,250	6,319,000	261,250	4.13
33	Primary Metals	200,291,841	351,917,162	-151,625,321	-43.09	40,928,870	33,855,900	7,072,970	20.89
34	Fabricated Metals	2,674,942	2,524,281	150,661	5.97	263,100	250,411	12,689	5.07
35	Machinery, except Electrical	2,834	252,211	-249,377	-98.88	0	0	0	—
36	Electric and Electronic Equip.	1,093,042	1,794,164	-701,122	-39.08	32,403	80,498	-48,095	-59.75
37	Transportation Equipment	808,706	923,384	-114,678	-12.42	1,623	0	1,623	—
38	Measuring, Photographic Goods	368,228	45,833	322,395	703.41	250	0	250	—
39	Misc. Manufacturing	27,950	128,568	-100,618	-78.26	0	250	-250	—
	Multiple SIC codes in 20 - 39	65,476,500	23,453,403	42,023,097	179.18	172,655,866	215,715,363	-43,059,497	-19.96
	No SIC codes in 20 - 39	2,314,504	319,548	1,994,956	624.31	0	26,462	-26,462	—
	TOTAL	452,517,212	640,952,201	-188,434,989	-29.40	1,195,388,282	1,285,625,670	--90,237,388	-7.02

Table 8-B. Changes in TRI Matched Releases by State, 1987-1988.

STATE*	TOTAL AIR RELEASES				SURFACE WATER DISCHARGES			
	1988 Pounds	1987 Pounds	CHANGE Pounds	CHANGE Percent	1988 Pounds	1987 Pounds	CHANGE Pounds	CHANGE Percent
Alabama	47,357,108	91,429,852	-44,072,744	-48.20	6,778,725	13,386,457	-6,607,732	-49.36
Alaska	21,931,445	31,306,063	-9,374,618	-29.95	2,221,867	4,760,765	-2,538,898	-53.33
American Samoa	29,500	56,250	-26,750	-47.56	0	0	0	—
Arizona	12,880,650	15,738,035	-2,857,385	-18.16	1,750	2,250	-500	-22.22
Arkansas	41,923,719	45,833,111	-3,909,392	-8.53	6,810,306	5,288,462	1,521,844	28.78
California	67,993,782	69,608,529	-1,614,747	-2.32	10,856,920	23,326,917	-12,469,997	-53.46
Colorado	9,503,941	9,337,185	166,756	1.79	87,664	231,966	-144,302	-62.21
Connecticut	20,120,268	23,885,020	-3,764,752	-15.76	7,286,999	9,996,258	-2,709,259	-27.10
Delaware	4,723,358	5,732,124	-1,008,766	-17.60	477,871	1,504,378	-1,026,507	-68.23
Florida**	42,170,627	47,343,376	-5,172,749	-10.93	55,666,121	19,268,256	36,397,865	188.90
Georgia	75,495,433	82,611,269	-7,115,836	-8.61	6,273,054	9,144,976	-2,871,922	-31.40
Hawaii	740,348	924,580	-184,232	-19.93	9,500	23,750	-14,250	-60.00
Idaho	3,734,114	3,262,688	471,426	14.45	279,020	540,749	-261,729	-48.40
Illinois	90,162,497	93,936,353	-3,773,856	-4.02	14,072,807	13,455,353	617,454	4.59
Indiana	91,168,533	95,312,997	-4,144,464	-4.35	4,750,814	5,623,363	-872,549	-15.52
Iowa	40,594,977	37,790,610	2,804,367	7.42	1,235,706	1,141,651	94,055	8.24
Kansas	22,575,271	22,444,347	130,924	0.58	766,582	1,463,708	-697,126	-47.63
Kentucky	41,197,448	42,359,894	-1,162,446	-2.74	1,526,338	1,221,415	304,923	24.96
Louisiana	129,078,997	133,187,968	-4,108,971	-3.09	155,880,982	192,846,901	-36,965,919	-19.17
Maine	15,041,527	15,356,446	-314,919	-2.05	392,998	760,866	-367,868	-48.35
Maryland	16,024,906	17,079,800	-1,054,894	-6.18	3,587,795	9,925,721	-6,337,926	-63.85
Massachusetts	22,522,055	25,962,061	-3,440,006	-13.25	255,448	135,253	120,195	88.87
Michigan	83,421,102	101,090,105	-17,669,003	-17.48	1,092,203	968,543	123,660	12.77
Minnesota	44,943,731	42,749,715	2,194,016	5.13	2,717,195	2,747,132	-29,937	-1.09
Mississippi	48,722,356	51,870,105	-3,147,749	-6.07	1,602,081	2,572,291	-970,210	-37.72
Missouri	42,750,662	42,350,805	399,857	0.94	3,751,347	2,768,275	983,072	35.51
Montana	2,239,432	2,657,648	-418,216	-15.74	110,944	136,122	-25,178	-18.50
Nebraska	15,719,566	11,094,698	4,624,868	41.69	295,336	167,883	127,453	75.92
Nevada	614,626	615,826	-1,200	-0.19	250	0	250	—
New Hampshire	10,192,683	11,394,737	-1,202,054	-10.55	484,711	819,891	-335,180	-40.88
New Jersey	31,780,720	36,443,263	-4,662,543	-12.79	895,349	1,341,428	-446,079	-33.25
New Mexico	1,821,663	2,147,455	-325,792	-15.17	250	4,316	-4,066	-94.21
New York	84,444,828	88,459,103	-4,014,275	-4.54	1,935,142	2,809,516	-874,374	-31.12
North Carolina	78,051,959	85,825,196	-7,773,237	-9.06	560,517	1,438,563	-878,046	-61.04
North Dakota	845,718	562,700	283,018	50.30	3,600	3,600	0	0.00
Ohio	121,170,657	126,082,305	-4,911,648	-3.90	5,473,673	7,528,267	-2,054,594	-27.29
Oklahoma	26,294,828	30,916,583	-4,621,755	-14.95	332,852	391,329	-58,477	-14.94
Oregon	17,589,111	18,507,842	-918,731	-4.96	169,066	331,911	-162,845	-49.06
Pennsylvania	67,231,434	77,714,295	-10,482,861	-13.49	3,606,120	4,034,275	-428,155	-10.61
Puerto Rico	14,319,458	12,181,959	2,137,499	17.55	74,661	265,927	-191,266	-71.92
Rhode Island	4,768,727	5,205,128	-436,401	-8.38	73,876	54,459	19,417	35.65
South Carolina	57,144,672	59,036,088	-1,891,416	-3.20	1,196,460	1,140,879	55,581	4.87
South Dakota	2,255,638	2,310,098	-54,460	-2.36	2,400	3,698	-1,298	-35.10
Tennessee	123,280,281	126,847,725	-3,567,444	-2.81	6,265,405	10,213,323	-3,947,918	-38.65
Texas	149,744,197	190,269,235	-40,525,038	-21.30	3,213,500	4,021,875	-808,375	-20.10
Utah	118,237,428	82,657,614	35,579,814	43.04	253,153	103,744	149,409	144.02
Vermont	1,071,727	1,163,267	-91,540	-7.87	77,058	134,195	-57,137	-42.58
Virgin Islands	1,490,792	2,032,103	-541,311	-26.64	2,500	3,000	-500	-16.67
Virginia	110,408,578	124,285,770	-13,877,192	-11.17	19,701,276	18,632,210	1,069,066	5.74
Washington	24,335,248	26,960,054	-2,624,806	-9.74	7,420,257	4,824,697	2,595,560	53.80
West Virginia	30,597,062	34,825,417	-4,228,415	-12.14	2,120,751	2,177,642	-56,891	-2.61
Wisconsin	37,266,306	43,080,567	-5,814,261	-13.50	520,811	1,414,986	-894,175	-63.19
Wyoming	2,913,394	2,361,550	551,844	23.37	41,750	91,237	-49,487	-54.24
TOTAL	2,172,639,028	2,354,197,514	-181,558,486	-7.71	343,213,761	385,194,629	-41,980,868	-10.90

* The District of Columbia is not included because it had no matched facilities.

** Corrections to the data subtract 48,600,000 pounds from 1988 surface water discharges in Florida (see Box 3-C).

Table 8-B, continued.

STATE*	ON-SITE LAND				UNDERGROUND INJECTION			
	1988 Pounds	1987 Pounds	CHANGE		1988 Pounds	1987 Pounds	CHANGE	
			Pounds	Percent			Pounds	Percent
Alabama	4,248,355	5,496,833	-1,248,478	-22.71	1,634,717	1,428,391	206,326	14.44
Alaska	1,462	12,680	-11,218	-88.47	1,018	0	1,018	—
American Samoa	0	0	0	—	0	0	0	—
Arizona	47,606,748	48,088,436	-481,688	-1.00	0	0	0	—
Arkansas	967,691	1,192,254	-224,563	-18.84	7,036,201	9,416,128	-2,379,927	-25.28
California	16,539,680	8,540,127	7,999,553	93.67	895,568	1,532,739	-637,171	-41.57
Colorado	2,575,955	5,240,022	-2,664,067	-50.84	0	250	-250	—
Connecticut	1,633,511	1,036,403	597,108	57.61	0	0	0	—
Delaware	250,717	317,546	-66,829	-21.05	0	0	0	—
Florida**	75,824,140	180,825,893	-105,001,753	-58.07	34,640,279	22,572,490	12,067,789	53.46
Georgia	8,942,420	6,372,921	2,569,499	40.32	0	19,500	-19,500	—
Hawaii	179,495	121,463	58,032	47.78	1,051,509	1,074,269	-22,760	-2.12
Idaho	10,159,315	5,242,357	4,916,958	93.79	1,400	0	1,400	—
Illinois	7,276,607	5,865,818	1,410,789	24.05	7,299,783	13,416,438	-6,116,655	-45.59
Indiana	62,859,565	23,049,347	39,810,218	172.72	34,815,450	32,976,374	1,839,076	5.58
Iowa	92,490	319,286	-226,796	-71.03	0	0	0	—
Kansas	477,924	313,409	164,515	52.49	90,739,460	65,957,160	24,782,300	37.57
Kentucky	5,575,702	3,503,932	2,071,770	59 13	30,000,250	25,000,000	5,000,250	20.00
Louisiana	909,524	1,416,384	-506,860	-35.79	423,296,460	484,655,681	-61,359,221	-12.66
Maine	331,071	315,432	15,639	4.96	0	0	0	—
Maryland	2,650,502	2,014,297	636,205	31.58	0	750	-750	—
Massachusetts	808,613	765,569	43,044	5.62	4,000	250	3,750	1,500.00
Michigan	4,355,053	1,759,256	2,595,797	147.55	5,484,260	4,969,730	514,530	10.35
Minnesota	870,188	705,076	165,112	23.42	0	0	0	—
Mississippi	8,946,098	9,236,972	-290,874	-3.15	46,803,000	43,614,250	3,188,750	7.31
Missouri	11,564,602	11,733,567	-168,965	-1.44	500	0	500	—
Montana	30,890,407	31,364,637	-474,230	-1.51	0	0	0	—
Nebraska	49,830	261,650	-211,820	-80.96	0	0	0	—
Nevada	3,096,319	128,050	2,968,269	2,318.05	0	0	0	—
New Hampshire	428,868	516,240	-87,372	-16.92	0	0	0	—
New Jersey	2,163,630	1,811,698	351,932	19.43	2,500	280	2,220	792.86
New Mexico	10,128,301	11,562,057	-1,433,756	-12.40	0	0	0	—
New York	981,853	3,648,204	-2,666,351	-73.09	1	250	-249	-99.60
North Carolina	19,425,065	15,042,285	4,382,780	29.14	250	0	250	—
North Dakota	502	500	2	0.40	0	0	0	—
Ohio	18,856,373	22,526,105	-3,669,732	-16.29	56,888,700	64,925,648	-8,036,948	-12.38
Oklahoma	842,586	944,778	-102,192	-10.82	6,294,383	6,863,944	-569,561	-8.30
Oregon	845,556	1,263,611	-418,055	-33.08	0	0	0	—
Pennsylvania	13,684,956	11,143,642	2,541,314	22.81	0	250	-250	—
Puerto Rico	109,726	72,100	37,626	52.19	0	0	0	—
Rhode Island	82,307	66,913	15,394	23.01	0	0	0	—
South Carolina	1,191,403	1,367,004	-175,601	-12.85	0	0	0	—
South Dakota	1	1	0	0.00	0	0	0	—
Tennessee	12,239,591	11,149,536	1,090,055	9.78	49,897,310	67,671,200	-17,773,890	-26.27
Texas	25,322,902	24,769,858	553,044	2.23	371,388,389	408,557,558	-37,169,169	-9.10
Utah	13,538,253	164,032,205	-150,493,952	-91.75	0	0	0	—
Vermont	0	151	-151	—	0	0	0	—
Virgin Islands	140,342	86,755	53,587	61.77	0	0	0	—
Virginia	4,740,478	4,441,653	298,825	6.73	1,373	250	1,123	449.20
Washington	887,892	1,332,859	-444,967	-33.38	0	250	-250	—
West Virginia	688,750	8,330,198	-7,641,448	-91.73	97,712	319,219	-221,507	-69.39
Wisconsin	1,303,534	1,221,956	81,578	6.68	250	750	-500	-66.67
Wyoming	15,230,359	382,275	14,848,084	3,884.14	27,113,559	30,651,671	-3,538,112	-11.54
TOTAL	452,517,212	640,952,201	-188,434,989	-29.40	1,195,388,282	1,285,625,670	-90,237,388	-7.02

* The District of Columbia is not included because it had no matched facilities.
** Corrections to the data add 100,000,000 pounds to underground injection in Texas (see Box 3-C).

CHAPTER 9. CHANGES IN TRI TRANSFERS, 1987–1988

As in the previous chapter, this chapter analyzes the set of matched chemicals (those reported in both 1987 and 1988 by facilities that reported in both years). It focuses first on transfers to publicly operated sewage treatment plants and then on off-site transfers to other waste management facilities for treatment, storage and disposal. (See Figure 9–1.)

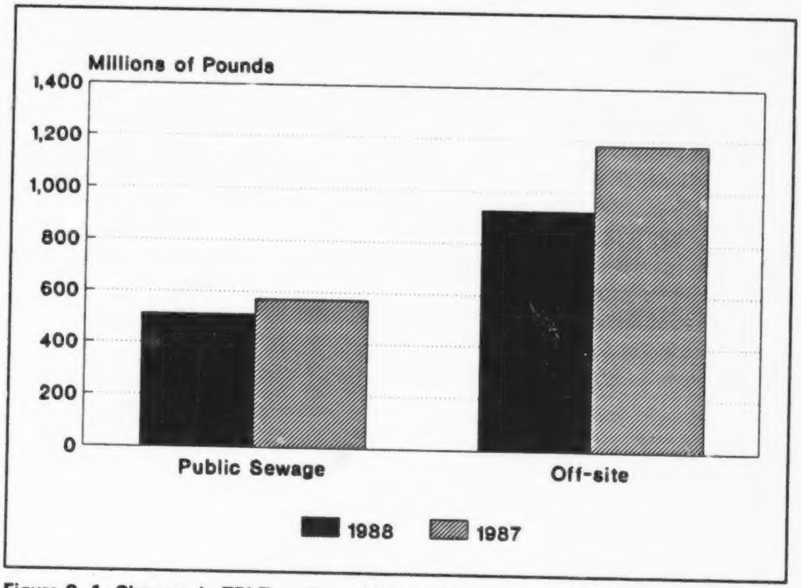


Figure 9–1. Changes in TRI Transfers of Matched Chemicals, 1987–1988.

TRANSFERS TO PUBLIC SEWAGE TREATMENT PLANTS

Facilities discharging toxic chemicals to public sewage treatment plants are subject to many Federal, State, and local regulations, as are the receiving plants. The national Pretreatment Program, developed under the Clean Water Act, regulates industrial wastewater discharges in several ways:

- it requires certain industries to treat their wastes before sending them to the public sewage treatment plant;
- it prohibits certain discharges that would either interfere with a sewage treatment plant's operation or pass through untreated; and
- it issues standards regulating the level of certain pollutants that various industries can discharge to the plants.

The program also requires approximately 1,500 public sewage treatment plants to establish and enforce their own pollutant-specific discharge limitations for industrial users through an EPA- or state-approved pretreatment program. Together, Federal and local limitations combine general and site-specific considerations: the capability of technology to remove certain pollutants from industrial effluents, the ability of the treatment plant to handle certain quantities and types of incoming wastes, and local health and environmental objectives for water and sludge quality.

Transfers to public sewage treatment plants are only one of many ways that TRI chemicals may eventually end up in surface water or affect water quality, and only part of those transfers end up in the water. TRI data indicates only what *goes* to a sewage treatment plant, not the degree of treatment the chemicals receive there or what portion of them are ultimately discharged to air, land, or water.

Public sewage transfers of matched chemicals decreased 10% from 1987 to 1988.

Transfers of TRI chemicals to public sewage treatment plants from matched facilities of matched chemicals decreased 59.1 million pounds (ten percent) from 1987 to 1988. This is less than the 13-percent decrease overall for matched chemicals. Similar to the pattern for total TRI releases and transfers, most matched facilities reporting transfers to public sewage systems reported on the same chemicals in both years. Releases and transfers of these matched chemicals were 570.4 million pounds (97 percent) of the 589.8 million total in 1987 and 511.3 million pounds (96 percent) in 1988. (See Figure 9–1.)

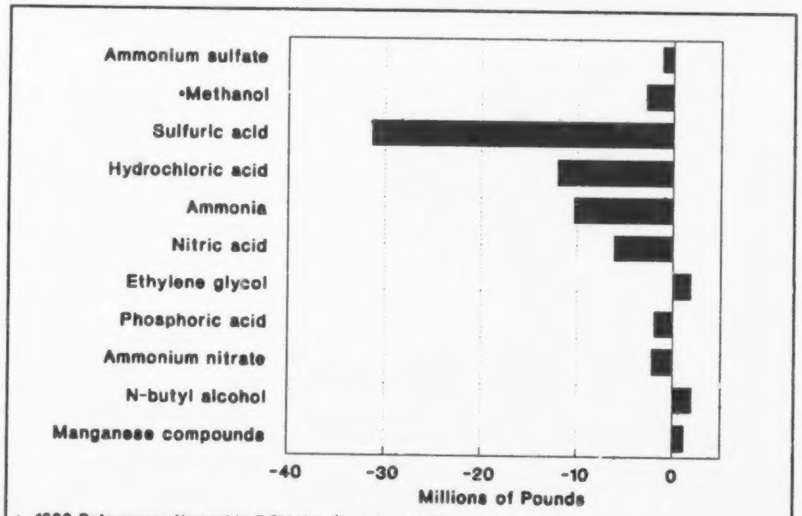
Chemical Distribution

The net decrease in pounds of public sewage transfers between 1987 and 1988 tends to mask the ups and downs of individual chemicals. More chemicals decreased between the two years than increased, and the total decreases were greater in amount than the increases. National totals do not reflect what is happening in individual communities, however, and may mask considerable variation at the local level. The significance of the national net decrease compared to local variations depends on one's perspective. The net decrease may suggest progress in the national Pretreatment Program and indicate a reduced burden of industrial wastes on public sewage treatment plants nationwide, but citizens or public officials will more likely be interested in local increases than in the nationwide net decrease. (See Box 9-A.)

Overall, public sewage transfers decreased for more TRI chemicals than increased, but local variations may be more extreme.

Transfers to public sewage of sulfuric acid, hydrochloric acid, and ammonia each decreased over ten million pounds from 1987 and 1988, together accounting for 53.5 million pounds of the total 59.1 million pounds (91 percent) of decreases in transfers to public sewage systems. Discharges of sulfuric acid dropped 40 percent, from 77.6 to 46.2 million pounds; hydrochloric acid was down 29 percent (from 41.9 to 30.0 million pounds); and ammonia decreased by one third (from 31.7 to 21.5 million pounds). (See Figure 9-2 and Table 9-1.)

3 chemicals accounted for 90% of the decrease in transfers to public sewage systems . . .



• 1988 Data correction adds 7.9M lbs. (see Box 3-C)

Figure 9-2. Matched Chemicals with the Greatest Changes in TRI Transfers to Public Sewage Treatment Plants, 1987-1988. Chemicals shown in descending order according to 1988 total matched public sewage transfers.

BOX 9-A. INTERPRETING TRENDS IN PUBLIC SEWAGE TRANSFERS

TRI data raise many questions about the reasons for and effects of changes in transfers to public sewage treatment plants—questions that are more effectively addressed at the local level, looking at specific situations for particular manufacturing facilities and the public sewage treatment plants that receive their wastes, than on a nationwide scale. Among the factors to consider in evaluating local changes are the following:

- Do new or revised pretreatment standards for a particular industry cause a reduction in discharges? As of 1988, EPA has issued categorical pretreatment standards for 42 industrial categories, and many other new and revised standards were under development. Pretreatment standards generally affect specific subsets of the broad industrial categories indicated by two-digit SIC codes. For example, Storage Battery manufacturers (SIC 3691) are one subset of the larger Electrical and Electronic Machinery industry (SIC 36), and separate pretreatment requirements have been developed for six different subcategories of Storage Battery manufacturers.
- Did a reported decrease result from a TRI facility's actual reductions in the use of particular TRI chemicals, from more extensive treatment prior to discharging to sewage systems, or from a shift to a different route (such as off-site transfers to facilities other than sewage treatment plants or direct on-site releases to surface water)?
- Did sewage transfers increase because of new restrictions in other areas (such as a land ban under RCRA or tighter controls on air emissions that curbed on-site releases)? If so, did the change represent a short-term response to the immediate problem or a longer-term decision about waste management?
- Did an increase/decrease correspond to a proportional change in the facility's production or use of the TRI chemical(s), or was it the result of stronger or weaker environmental controls over the same amount of production levels? (Facilities may have provided data on the change in production levels in the optional waste minimization section—see Chapter 11.)
- Can the mix of TRI chemicals discharged by the manufacturing facility be effectively or efficiently removed by the treatment plant without producing large amounts of hazardous sludge or other emissions there? The removal rate for different pollutants varies from 0 to 99 percent.
- Are alternative means of reuse, treatment, and disposal of TRI chemical discharges available? What are the environmental pluses and minuses of sewage transfer compared to the alternatives?
- Did locally-established pretreatment standards (local limits) reduce pollutant discharges? Over 1,500 publicly owned treatment works (POTWs—the regulatory term for public sewage plants) nationwide have approved local pretreatment programs to control industrial discharges to sewers. Among other requirements, these POTWs set local limits that may be more stringent than EPA categorical pretreatment standards. These local limits take into account site-specific considerations (such as the size and capability of the wastewater treatment plant) and are designed to protect the POTW treatment plant, its municipal sewage sludge, and the receiving stream.

Table 9-1. Changes in TRI Transfers to Public Sewage Treatment Plants of Matched Chemicals*, 1987-1988.

CHEMICAL	1988 TRANSFERS TO PUBLIC SEWAGE Pounds	1987 TRANSFERS TO PUBLIC SEWAGE Pounds	1987-1988 CHANGE	
			Pounds	Percent
AMMONIUM SULFATE	183,036,850	184,147,838	-1,110,988	-0.60
METHANOL**	101,196,379	104,018,198	-2,821,819	-2.71
SULFURIC ACID	46,235,560	77,572,532	-31,336,972	-40.40
HYDROCHLORIC ACID	29,879,626	41,909,682	-12,030,056	-28.70
AMMONIA	21,470,187	31,733,384	-10,263,197	-32.34
NITRIC ACID	21,431,073	27,521,500	-6,090,427	-22.13
ETHYLENE GLYCOL	14,772,427	12,873,305	1,899,122	14.75
ACETONE	13,323,211	13,670,526	-347,315	-2.54
PHOSPHORIC ACID	8,424,992	10,324,600	-1,899,608	-18.40
AMMONIUM NITRATE	7,263,605	9,320,380	-2,056,775	-22.07
PHENOL	5,261,667	5,249,861	11,806	0.22
GLYCOL ETHERS	4,735,941	4,745,361	-9,420	-0.20
N-BUTYL ALCOHOL	4,429,428	2,479,214	1,950,214	78.66
FORMALDEHYDE	4,023,210	3,158,616	864,594	27.37
XYLENE (MIXED ISOMERS)	4,008,227	4,043,576	-35,349	-0.87
TOLUENE	3,373,474	2,872,700	500,774	17.43
DICHLOROMETHANE	2,505,482	1,694,302	811,180	47.88
CHLORINE	2,134,878	2,069,757	65,121	3.15
MANGANESE COMPOUNDS	1,768,141	546,519	1,221,622	223.53
ANILINE	1,660,626	1,825,742	-165,116	-9.04
DIETHANOLAMINE	1,644,975	738,753	906,222	122.67
TERT-BUTYL ALCOHOL	1,639,476	1,519,336	120,140	7.91
METHYL ISOBUTYL KETONE	1,497,696	1,271,859	225,837	17.76
CHROMIUM COMPOUNDS	1,337,223	894,264	442,959	49.53
CHLOROFORM	1,175,493	889,736	285,757	32.12
BENZENE	1,098,997	718,346	380,651	52.99
BIPHENYL	1,056,411	947,391	109,020	11.51
CYANIDE COMPOUNDS	1,053,011	700,680	352,331	50.28
CATECHOL	1,033,543	1,248,959	-215,416	-17.25
ZINC COMPOUNDS	790,963	1,633,775	-842,812	-51.59
SUBTOTAL	493,262,772	552,340,692	-59,077,920	-10.70
TOTAL FOR ALL OTHERS	18,030,370	18,039,787	-9,417	-0.05
GRAND TOTAL	511,320,053	570,413,766	-59,093,713	-10.36

*Chemicals with the largest matched transfers to public sewage for 1988.
**Corrections to data add 7,922,052 to 1988 transfers to public sewage.

Decreases generated by one or two facilities played significant roles in making up the net decrease for individual chemicals, although not always as large a role as individual facilities played in decreasing the *releases* described in the previous chapter. A Monsanto facility (Cahokia, Illinois) that reported the largest decreases cut discharges of sulfuric acid by 5.3 million pounds, accounting for 17 percent of the net decrease for the chemical. Monsanto's role in the reduction of hydrochloric acid public sewage transfers was larger—the facility's 7.0-million-pound decrease constituted 58 percent of the 12.0-million-pound net decrease of

. . . and large decreases at a few individual facilities significantly affected the reductions.

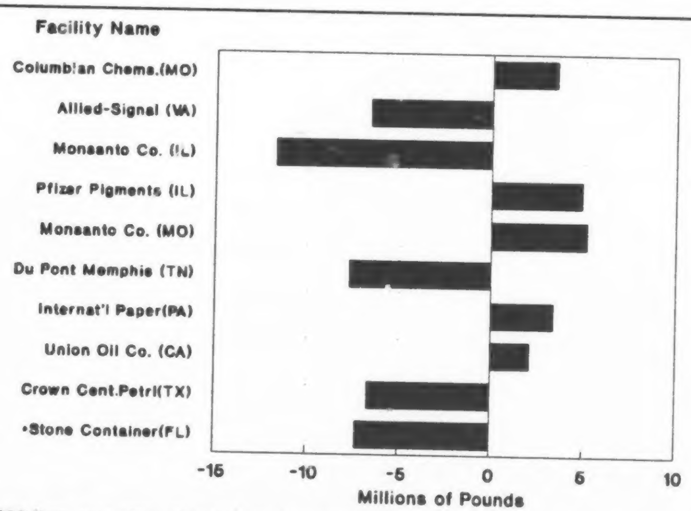
the chemical. As for the 10.3-million-pound reduction in ammonia discharges, a 1.3-million-pound cut by a Du Pont facility (Shelby, Tennessee) and a 6.6-million-pound cut by Crown Central Petroleum combined to make up 78 percent of the net decrease. (See Figure 9-3 and Table 9-2.)

The net decrease of 1.1 million pounds of ammonium sulfate masks major fluctuations . . .

Ammonium sulfate, one of the major components of discharges to public sewage systems, was subject to considerable fluctuation. Two facilities with the largest decreases—Du Pont (Memphis, Tennessee) and Allied-Signal (Hopewell, Virginia)—managed to cut discharges of ammonium sulfate by 11.4 million pounds, but the decreases were outweighed by increases totaling 15.2 million pounds at four facilities with the largest increases. The net decrease was thus produced by smaller changes at other facilities. (See Tables 9-1 and 9-2.)

. . . but the chemical still accounted for more than 1/3 of the 1988 amount.

Overall, the 183.0 million pounds of matched public sewage transfers of ammonium sulfate was 1.1 million pounds (under one percent) less than 1987 levels, but still represented 36 percent of the matched sewage total. Much of the ammonium sulfate probably results from the addition of sulfuric acid to an ammonia-laden wastestream to neutralize it. The neutral salt thus produced (ammonium sulfate) is not a particularly toxic chemical and would not ordinarily be expected to cause problems at the sewage treatment plant. It primarily affects water quality by the introduction of ammonia. Whether additional ammonia would



• 1988 Data correction add 7.9M lbs. (see Box 3-C).

Figure 9-3. TRI Facilities with the Greatest Changes in Matched Transfers to Public Sewage Treatment Plants, 1987-1988. Facilities shown in descending order according to 1988 public sewage totals.

Table 9-2. TRI Facilities with the Greatest Changes in Matched Transfers to Public Sewage Treatment Plants, 1987-1988.

SIC CODE	FACILITY NAME	CITY, COUNTY, STATE	1987 TRANSFERS TO PUBLIC SEWAGE Pounds	1987 TRANSFERS TO PUBLIC SEWAGE Percent	1988 TRANSFERS TO PUBLIC SEWAGE Pounds	1988 TRANSFERS TO PUBLIC SEWAGE Percent	CHEMICAL	GREATEST CHANGE Pounds
TOP FIVE FACILITIES REPORTING DECREASES								
28	Monsanto Co.	Cahokia, St. Clair, IL	33,520,750	86.68	21,829,640	82.86	Hydrochloric acid Sulfuric acid	-7,000,000 -5,300,000
Mult	Du Pont Memphis Plant	Memphis, Shelby, TN	11,565,270	71.89	3,878,230	49.41	Ammonia Ammonium sulfate	-1,330,000 -6,360,000
26	Stone Container Corp.**	Panama City, Bay, FL	7,607,791	69.65	270,946	11.70	Methanol Chloroform	-7,349,445 -8,492
29	Crown Central Petroleum	Pasadena, Harris, TX	6,972,950	96.55	278,446	22.93	Ammonia Phenol	-6,643,775 -84,587
28	Allied-Signal Inc.	Hopewell, Hopewell City, VA	31,981,500	64.17	25,339,614	56.61	Ammonium sulfate Phenol	-5,000,000 -50,000
TOP FIVE FACILITIES REPORTING INCREASES								
28	Monsanto Co.	St. Louis, St. Louis City, MO	1,555,000	67.63	6,735,084	97.09	Ammonium sulfate Methanol	4,720,000 210,000
28	Pfizer Pigments Inc.	East St. Louis, St. Clair, IL	8,160,495	73.12	13,106,119	78.20	Ammonium sulfate	4,968,894
28	Columbian Chemicals Co.	St. Louis, St. Louis, MO	48,862,080	99.89	52,378,727	99.81	Ammonium sulfate Zinc compounds	3,484,106 32,541
26	International Paper Co.	Erie, Erie, PA	97,200	11.85	3,459,400	77.09	Methanol Chloroform	3,350,000 12,200
28	Union Oil Co. of CA DBA Unocal	Wilmington, Los Angeles, CA	741,100	61.92	2,802,000	98.12	Ammonium sulfate Chromium compounds	2,060,000 900

*Percent that transfers to public sewage comprises of the facility's total releases and transfers.

**Corrections to the data add 7,922,052 pounds to 1988 transfers to public sewage (see Box 3-C).

create an aquatic environmental problem depends on the characteristics of a particular receiving body of water, especially on the amount and form of nitrogen already present. Ammonium sulfate and the other ammonia chemicals are controlled by national and state regulations and standards relating to their nutrient impact, oxygen demand, and toxicity.

Although there was a net reduction of ten percent, a large number of chemicals increased by more than one million pounds. The greatest increase was 2.0 million pounds for n-butyl alcohol (79 percent). Ethylene glycol and manganese compounds each increased by over one million pounds. Transfers to public sewage systems of manganese compounds in 1988 were more than triple the amount in 1987 (1.8 million pounds versus approximately 550,000 pounds). This is accounted for by one facility, the Givaudan Corp. (Clifton, New Jersey), which increased its sewage transfers of matched chemicals by 1.3 million pounds.

N-butyl alcohol increased the most—2.0 million pounds.

Chemical Classes

Acids/bases/salts dropped 54.5 million pounds, the largest decrease for any chemical class . . .

The class of acids/bases/salts comprised the largest portion of sewage transfers for matched chemicals—58 percent (whereas acids/bases/salts comprised only 38 percent of all releases and transfers of matched chemicals). However, the same class registered the largest decrease of all the chemical classes, a drop of 54.5 million pounds or 15 percent from 1987 to 1988. Six of the eleven chemicals that decreased more than one million pounds are in this chemical class: sulfuric acid, hydrochloric acid, nitric acid, ammonium nitrate, phosphoric acid, and ammonium sulfate. (See Figure 9-4 and Table 9-A, at end of Chapter. See also Chapter 12 for further analysis of the role of waste treatment (neutralization) in reducing discharges of acids/bases/salts.)

. . . but non-metallic organics decreased by the greatest proportion (30%).

The largest *proportional* decrease (30 percent) was for the non-metallic inorganics, a class with considerable variability in chemical properties and environmental concerns. Ammonia led the decreases for the class, dropping 10.3 million pounds—32 percent—from 1987 to 1988. Ammonia is a common chemical found in both household and industrial wastes. It is also generated within typical sewage treatment plants as a result of biological transformations of organic matter. This chemical is highly toxic to fish, but its toxicity depends on the pH and temperature of the receiving waters.

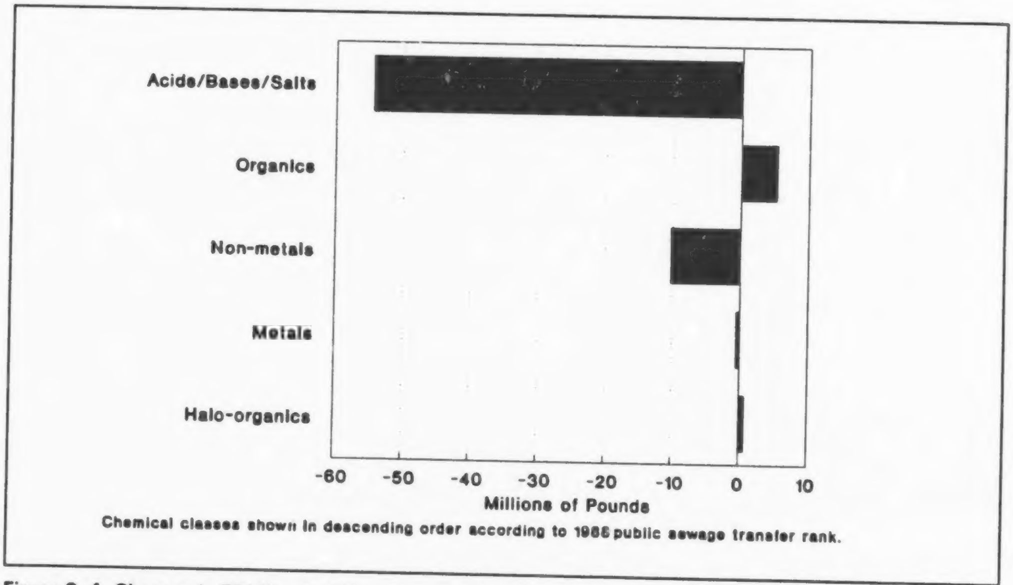


Figure 9-4. Changes in TRI Matched Transfers to Public Sewage Treatment Plants by Chemical Class, 1987–1988.

Matched sewage transfers of the organics class increased by the largest amount—5.4 million pounds (three percent). The largest change in the class was a 2.8-million-pound reduction in methanol, but this was offset by other increases, among them the 2.0-million-pound rise of n-butyl alcohol (79 percent) and the 1.9-million-pound increase of ethylene glycol (15 percent).

Organics increased 5.4 million pounds, led by increases of n-butyl alcohol and ethylene glycol.

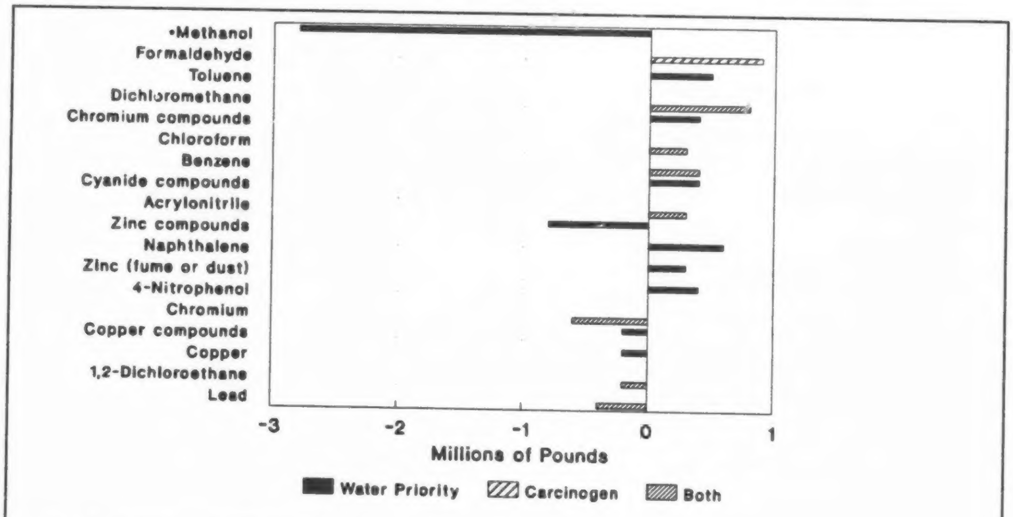
The only other class that increased was the halo-organics, with a 15-percent increase (794,016 pounds). The change resulted primarily because of the 48-percent increase (811,180 pounds) in dichloromethane, a cleaning solvent that is a liver toxin and suspected human carcinogen.

Halo-organics increased 15%, largely due to the increase of 1 carcinogen

Priority Pollutants and Carcinogens

Of the major matched chemicals transferred to public sewage systems, methanol is the water priority pollutant that decreased the most, by 2.8 million pounds (three percent). While the EPA regulates over 1,500 pollutants being discharged into waterways, 126 chemicals are designated as "priority pollutants." These are toxic metallic and organic compounds that are regulated through technology-based standards for facilities discharging directly to surface waters and through categorical pretreatment standards for specific industries discharging indirectly through public sewage systems.

Of all priority pollutants and carcinogens, only methanol ranked among the major chemicals for which large decreases were reported.



• 1988 Data correction add 7.9M lbs. (see Box 3-C).

Figure 9-5. Priority Pollutants and Carcinogens with the Greatest Changes in TRI Matched Transfers to Public Sewage Treatment Plants, 1987–1988. Chemicals shown in descending order according to 1988 public sewage totals.

Table 9-3. Changes in TRI Matched Transfers to Public Sewage Treatment Plants of Priority Pollutants and Carcinogens,* 1987-1988.

RATING**	CHEMICAL	1988 PUBLIC SEWAGE Pounds	1987 PUBLIC SEWAGE Pounds	1987-1988 CHANGE Pounds	Percent
P	METHANOL***	101,196,379	104,018,198	-2,821,819	-2.71
P	PHENOL	5,261,667	5,249,861	11,806	0.22
C	FORMALDEHYDE	4,023,210	3,158,616	864,594	-27.37
P	TOLUENE	3,373,474	2,872,700	500,774	17.43
C, P	DICHLOROMETHANE	2,505,482	1,694,302	811,180	47.88
P	CHROMIUM COMPOUNDS	1,337,223	894,264	442,959	49.53
C, P	CHLOROFORM	1,175,493	889,736	285,757	32.12
C, P	BENZENE	1,098,997	718,346	380,651	52.99
P	CYANIDE COMPOUNDS	1,053,011	700,680	352,331	50.28
C, P	ACRYLONITRILE	938,904	681,301	257,603	37.81
P	ZINC COMPOUNDS	790,963	1,633,775	-842,812	-51.59
P	NAPHTHALENE	767,917	140,252	627,665	447.53
P	ZINC (FUME OR DUST)	758,576	500,570	258,006	51.54
P	2,4-DINITROTOLUENE	700,000	770,000	-70,000	-9.09
P	CHLOROBENZENE	578,664	559,923	18,741	3.35
P	4-NITROPHENOL	560,428	183,450	376,978	205.49
P	DIMETHYL PHTHALATE	507,511	380,907	126,604	33.24
C, P	TETRACHLOROETHYLENE	496,379	367,633	128,746	35.02
C	ACETONITRILE	413,413	365,918	47,495	12.98
C	PROPYLENE OXIDE	403,656	383,390	20,266	5.29
P	ETHYLBENZENE	325,943	166,832	159,111	95.37
C, P	CHROMIUM	323,858	921,361	-597,503	-64.85
C	ETHYLENE OXIDE	254,269	404,715	-150,446	-37.17
P	COPPER COMPOUNDS	252,079	463,731	-211,652	-45.64
C	STYRENE	247,024	270,760	-23,736	-8.77
P	1,1,1-TRICHLOROETHANE	226,502	328,070	-101,568	-30.96
P	COPPER	199,905	426,419	-226,514	-53.12
C, P	DI-(2-ETHYLHEXYL) PHTHALATE	194,987	155,292	39,695	25.56
C	DICHLOROBENZENE	181,853	137,957	43,896	31.82
C, P	1,2-DICHLOROETHANE	176,951	409,035	-232,084	-56.74
P	2,6-DINITROTOLUENE	170,000	200,000	-30,000	-15.00
C, P	NICKEL	162,738	164,267	-1,529	-0.93
P	2-NITROPHENOL	149,000	127,684	21,316	16.69
P	1,2,4-TRICHLOROBENZENE	144,105	164,903	-20,798	-12.61
P	NICKEL COMPOUNDS	140,268	193,171	-52,903	-27.39
C	1,4-DIOXANE	139,971	92,267	47,704	51.70
P	1,2-DICHLOROPROPANE	136,772	91,510	45,262	49.46
	TOTAL	131,367,572	130,881,796	485,776	+0.37
	TOTAL FOR ALL OTHER PP AND CARCINOGENS	869,985	2,045,329	-1,175,344	-57.46
	PP AND CARCINOGEN TOTAL	132,237,557	132,927,125	-689,568	-0.52
	GRAND TOTAL	511,320,053	570,413,766	-59,093,713	-10.36

* Priority pollutants and carcinogens with the largest 1988 matched transfers to public sewage.

**Ratings: C = Carcinogen; P = Priority pollutant.

***Corrections to the data add 7.9 million pounds to 1988 transfers to public sewage (see Box 3-C).

Among the chemicals transferred both years to public sewage systems from TRI matched facilities were 108 chemicals that are either water priority pollutants, carcinogens, or both. Of these, 36 are carcinogens but not designated water priority pollutants, 54 are water priority pollutants but not carcinogens, and 18 are both. The reported amounts for 56 of these decreased between the two years, 44 increased, and eight remained the same. Only one of the top ten of these chemicals—methanol—decreased in 1988. (See Table 9-3 and Figure 9-5. See Chapter 4 for the definition of carcinogens used in this report. Appendix B lists the TRI chemicals that are priority pollutants and/or carcinogens.)

108 TRI chemicals discharged to public sewage plants were either water priority pollutants or carcinogens.

Methanol is an organic toxin causing adverse nervous system effects at moderately high levels, which is widely used industrially in surface treatment of painted products, as well as in a variety of consumer goods. It is not generally a serious problem for public sewage treatment plants as it can usually be removed fairly efficiently from the treatment plant's effluent and sludge. However, it could be a problem for aquatic toxicity in high concentrations because it is semi-volatile and degrades readily. Decreases of other water priority pollutants and carcinogens were much less dramatic than for methanol, and were somewhat offset by increases for other such chemicals.

The net decrease for the 108 carcinogens and water priority pollutants transferred to public sewage was only one half of one percent, and the net decrease for the top 40 of this list was ten times less than that (0.05 percent). This decrease is much smaller than the ten percent decrease for *all* matched chemicals discharged to public sewage. The discrepancy may arise from the fact that acids/bases/salts, none of which are designated priority pollutants or carcinogens, constituted by far the largest share of the discharges, as well as the largest amounts of decreases.

Carcinogens and water priority pollutants decreased by less than 1%, compared to the 10%-decrease for other chemicals.

Matched sewage transfers of 17 of the 40 major carcinogens and water priority pollutants decreased, with seven chemicals decreasing by more than 200,000 pounds. All seven decreasing chemicals are water priority pollutants; three are also carcinogens. The largest drop was a 2.8 million-pound reduction in methanol.

More chemicals on this list showed increases, 23 out of 40, with 11 registering increases greater than 200,000 pounds. Ten of the eleven are water priority pollutants, and four are also carcinogens. Formaldehyde, considered a carcinogen, increased by the greatest amount, 900,000 pounds, but is not usually a problem in the concentrations normally found at sewage treatment plants.

23 carcinogens and water priority pollutants increased in 1988.

Some chemicals raise sewage treatment concerns for reasons in addition to toxicity: they may be difficult to remove or transform by usual treatment methods, or may degrade very slowly; or they may pass through the treatment plant processes and be discharged with the effluent to the surface waters or accumulate in the sludge. The higher the level of toxic constituents in the sludge, the less likely it can be reused beneficially and the more of a disposal problem it becomes.

Among the carcinogens and water priority pollutants that increased from 1987 and 1988, cyanide compounds and chloroform are relatively resistent to effective removal at sewage treatment plants. Among the decreasing chemicals, the metals (such as lead, copper, and copper compounds) can often be removed effectively from the effluent water, but tend to accumulate in the resulting sludge solids.

The significant increases in zinc (fume or dust) and chromium compounds are difficult to assess, because other forms of these metals (zinc compounds and chromium) decreased. The type of treatment performed at sewage treatment plants is the key to interpreting the potential harms of TRI discharges. National TRI data listing net changes in pounds can indicate possible trends and give background information for examining individual situations, but do not definitively measure environmental progress in wastewater management.

Geographical Distribution

States with the largest TRI totals were not necessarily among the highest for public sewage.

The states with the largest matched transfers to public sewage treatment plants were quite different than those with the largest *total* releases and transfers. Only five states ranked in the top ten for both sewage transfers and TRI totals: Illinois; Texas; Virginia; Tennessee; and Ohio. Missouri, the leading state for sewage transfers, only ranked 15th for total matched releases and transfers. (See Table 9–B, at end of Chapter.)

14 states accounted for 85% of public sewage totals; Missouri's alone exceeded the combined matched amount from the other 39 jurisdictions.

Missouri is one of 14 states in which 1988 sewage transfers were greater than ten million pounds. Those 14 states accounted for 85 percent of the total for the year (434.7 million pounds). Missouri's 77.3 million pounds alone exceeded the 76.6 million pounds of matched sewage transfers of the remaining 39 jurisdictions. The Missouri totals were greatly affected by the large amounts from various St. Louis facilities (see Box 9–B). Missouri's matched facilities sent 53 percent of their matched TRI amounts to sewage treatment plants, compared to 33 percent and 29 percent for the next highest states (New Jersey and Hawaii).

Facilities in 13 states, led by Texas, decreased transfers to public sewage by more than 1 million pounds.

Thirteen states had decreases of more than one million pounds. Facilities in Texas reported the greatest reduction (15.0 million pounds, 28 percent), followed by Illinois (10.4 million pounds, 15 percent). Facilities in those states reporting the greatest decreases were the Monsanto Company in Cahokia, Illinois (in the St. Louis metropolitan area) and Crown Central Petroleum in Pasadena, Texas. (See Figure 9–6 and Table 9–B, at end of Chapter.)

Sewage transfers in Missouri, Massachusetts, and Pennsylvania increased by more than 1 million pounds each.

Facilities in only three states increased matched sewage transfers by more than one million pounds from 1987 and 1988. Missouri, which had the largest total, also reported the greatest increase (6.9 million pounds, ten percent), followed by Massachusetts (3.1 million pounds, 25 percent), and Pennsylvania (1.8 million pounds, 14 percent). The International Paper Company plant in Erie, Pennsylvania increased methanol by 3.4 million pounds (3,459 percent), contributing significantly to the net increase for that state.

BOX 9-B. DISCHARGES TO PUBLIC SEWAGE SYSTEMS IN THE ST. LOUIS AREA

Facilities in the St. Louis area dominated transfers to public sewage. Three Chemical industry facilities in the St. Louis area reported the largest increases in matched sewage transfers from 1987 to 1988. The largest absolute increase (in pounds) for sewage transfers was reported by a Monsanto facility in St. Louis, Missouri—a 5.2-million-pound increase, three times greater than its 1987 transfers of 1.6 million pounds. Pfizer Pigments Inc. (East St. Louis, Illinois) reported the next largest increase, 4.9 million pounds (61 percent over its 8.2 million pounds in 1987), followed by Columbian Chemicals in St. Louis, Missouri, with a 3.5-million-pound increase, or seven percent more than its 48.9 million pounds in 1987. The two Missouri facilities accounted for 84 percent of that state's 77.6 million pounds of 1988 matched public sewage transfers to public sewage, which earned it first position among all states in the amount of such transfers. (See Table 9-2.)

The largest *decreases* in matched sewage transfers surpassed the increases, however. Decreases for the five facilities reporting the greatest matched sewage decreases totaled 49.8 million pounds or 68 percent of the total decrease of 59.1 million pounds. Again, the role of St. Louis is prominent. Another Monsanto Company facility in the St. Louis metropolitan area, this one in Cahokia, Illinois, reported the largest *decreases* for matched public sewage transfers, cutting its 33.5 million-pound total for 1987 by 11.7 million pounds (35 percent), or over twice the amount of the increase from the Monsanto facility in St. Louis, Missouri. Two facilities among the top five for greatest decreases reported a 96-percent reduction in their matched sewage transfers: Stone Container Corporation in Panama City, Florida, and Crown Central Petroleum in Pasadena, Texas. (Note, however, that data corrections for Stone Container Corp. have increased the reported amounts by 7.9 million pounds, eliminating the apparent decrease—see Box 3-C.)

The prominence of the St. Louis area in total amounts, increases, and decreases of matched public sewage transfers is unusual and warrants closer examination. St. Louis facilities generally tend to use the sewage system for disposal of toxic chemicals as opposed to other methods. Although sewage transfers made up only nine percent of total TRI amounts in 1988 for matched facilities, the percentage for the St. Louis facilities showing large increases was many times that amount: 99.8 percent for Columbian Chemicals, 97 percent for Monsanto, and 78 percent for Pfizer Pigments.

The two facilities in St. Louis discharged their TRI wastes to two different sewage treatment plants of the St. Louis Metropolitan Sewer District. Columbian Chemicals discharged to the Le May Treatment Plant and its 52.3 million pounds accounted for 99 percent of the 52.4 million pounds of TRI wastes received at this plant from all TRI facilities during 1988. Likewise, the Monsanto Company discharged to the Bissell Point Treatment Plant and its 6.7 million pounds accounted for 97 percent of all TRI wastes received at the Bissell Point plant in 1988.

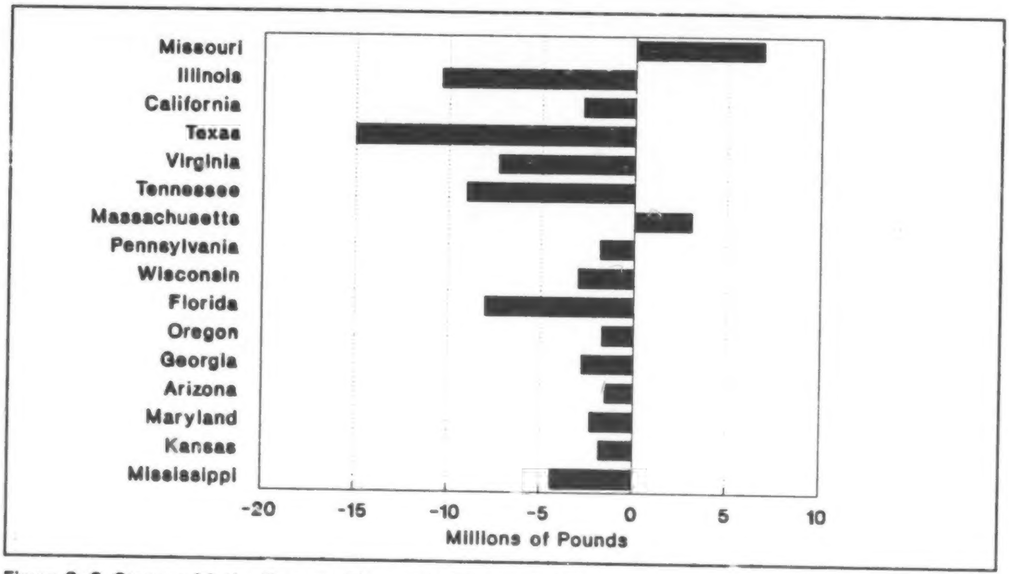
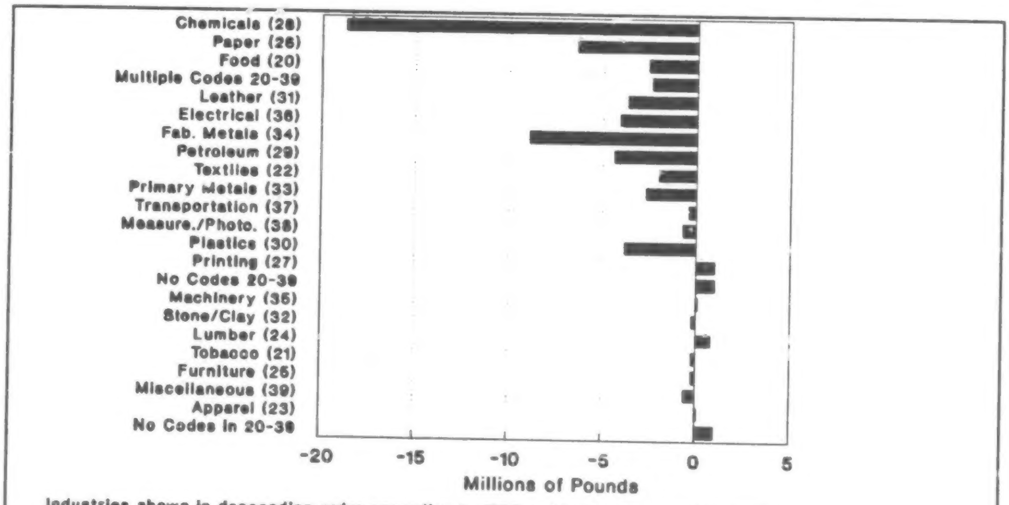


Figure 9-6. States with the Greatest Changes in TRI Matched Transfers to Public Sewage Treatment Plants, 1987-1988. States shown in descending order according to 1988 public sewage transfer totals.



Industries shown in descending order according to 1988 public sewage transfer rank.

Figure 9-7. Industries with the Greatest Changes in TRI Matched Transfers to Public Sewage Treatment Plants, 1987-1988. Industries shown in descending order according to 1988 public sewage transfer totals.

Industrial Distribution

The Chemical industry reported by far the largest amount of TRI transfers to public sewage treatment plants of chemicals reported in both years from matched facilities: 313.9 million pounds in 1988, or 61 percent of all such transfers. The next largest contributors did not come close to approaching those of the Chemical industry. Paper Products reported 38.0 million pounds (seven percent), followed by Food Products with 30.1 million pounds (six percent) and Multiple Codes with 27.8 million pounds (six percent). These top four contributors of public sewage transfers ranked the same in 1987. (See Figure 9-7 and Table 9-C, at end of Chapter.)

The Chemical industry accounted for 61% of the total transfers to public sewage systems . . .

Although the Chemical industry dominated matched transfers to public sewage treatment plants, those transfers represented only 11 percent of that industry's total matched TRI amounts. The Leather Products and Food Products industries relied much more heavily on public sewage, reporting 59 percent and 53 percent, respectively, of their total matched TRI amounts. In all, 18 industries cut public sewage transfers, contributing to the overall reduction of 59.1 million pounds (ten percent). The largest reduction (in pounds) came from the Chemical industry (18.7 million pounds, six percent); the greatest proportional reduction came from Miscellaneous Manufacturing (600,000 pounds, 73 percent).

. . . and cut its total by 18.7 million pounds (10%).

OFF-SITE TRANSFERS

Off-site transfers to waste management facilities other than public sewage treatment plants of matched chemicals decreased 255.8 million pounds (22 percent). This decrease accounted for about one-third, 31 percent, of the net decrease of TRI releases and transfers of matched chemicals. Despite the relatively large decrease, off-site transfers accounted for nearly one fifth of total releases and transfers in both 1987 and 1988. (See Figure 9-1.)

Off-site transfers decreased 255.8 million pounds, more than any other type of release.

Only 2 chemicals accounted for the underground injection releases and only 2 facilities were responsible for these releases.

Given the significant role played by underground injection in the releases and transfers of the Inorganic Pigments industry, it is interesting that only two chemicals were injected underground: hydrochloric acid (78.0 million pounds) and manganese compounds (6.5 million pounds). Further analysis revealed that only two facilities were responsible for these releases: the Du Pont Johnsonville Plant in New Johnsonville, Tennessee, with 40 million pounds of hydrochloric acid and 4 million pounds of manganese compounds; and the Du Pont Delisle Plant in Pass Christian, Mississippi, with 38 million pounds of hydrochloric acid and 2.5 million pounds of manganese compounds. This situation once again demonstrates how releases of one or two chemicals can influence the overall picture and emphasizes the importance of analyzing the impact of releases and transfers on an individual basis. It also points out how it is often the case that large releases can be accounted for by only one or two facilities.

7 of the chemicals released or transferred by the Inorganic Pigments industry were classified as carcinogenic.

Of the chemicals released by the Inorganic Pigments industry, only seven fall into the TRI carcinogenic category. Releases and transfers of these carcinogens totalled 109,000 pounds or 0.1 percent of total releases and transfers for this industry, while only approximately six percent of the Chemical industry's releases and transfers are carcinogenic. This difference may be due in part to the fact that halo-organics, which as a class contain a high percentage of carcinogens, do not play a significant role in the releases and transfers of the Inorganic Pigments industry. (See Table 12-15.)

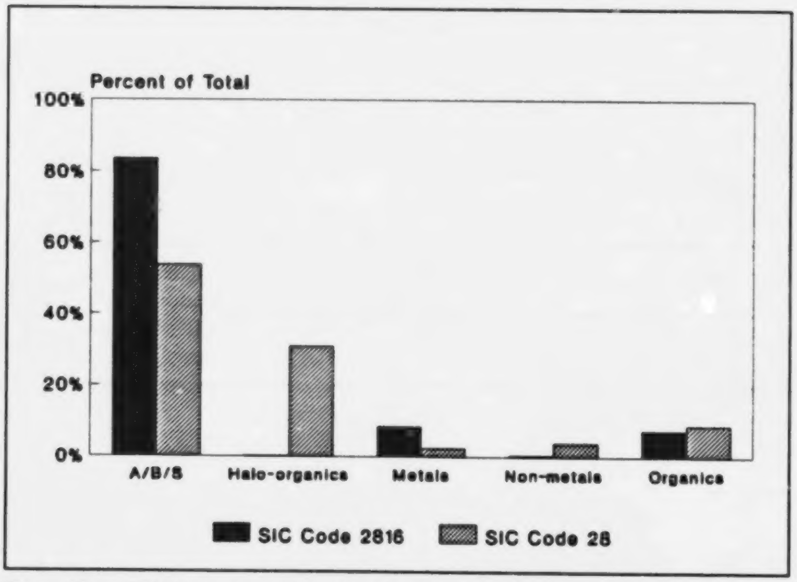


Figure 12-7. TRI Releases and Transfers by Chemical Class for the Inorganic Pigments Industry Compared to the Chemical Industry as a Whole, 1988.

It is also well worth noting that 86 percent of carcinogenic releases and transfers were due to one chemical: dichloromethane. Given the role this chemical plays in the releases and transfers of this industry, it is not surprising that the majority of releases (86 percent) are emitted to air. As indicated in Chapter 4 (Table 4–11), 93 percent of all dichloromethane releases are air releases.

On a statewide basis, facilities in the Inorganic Pigments industry reported releases and transfers in only 18 out of 54 states and territories; the Chemical industry reported in 52 out of 54 states and territories. Three states dominated the list and acccunted for 71 percent of all releases and transfers: Tennessee, Missouri, and Mississippi with 52.7 million pounds, 52.5 million pounds, and 49.2 million pounds, respectively. Tennessee and Mississippi ranked high because of the two Du Pont facilities cited above. Besides releasing large amounts of hydrochloric acid and manganese compounds, each facility also released significant amounts of carbonyl sulfide (i.e., 8.5 million pounds and 6 million pounds, respectively). Missouri's high ranking was due to one facility as well: Columbian Chemicals Company in St. Louis which reported releases and transfers totalling 52.5 million pounds. Almost 100 percent of this total was accounted for by transfers of ammonium sulfate to public sewage systems. Louisiana, which ranked first in total TRI releases and transfers, had no facilities reporting solely in the Inorganic Pigments industry. (See Table 12–16.)

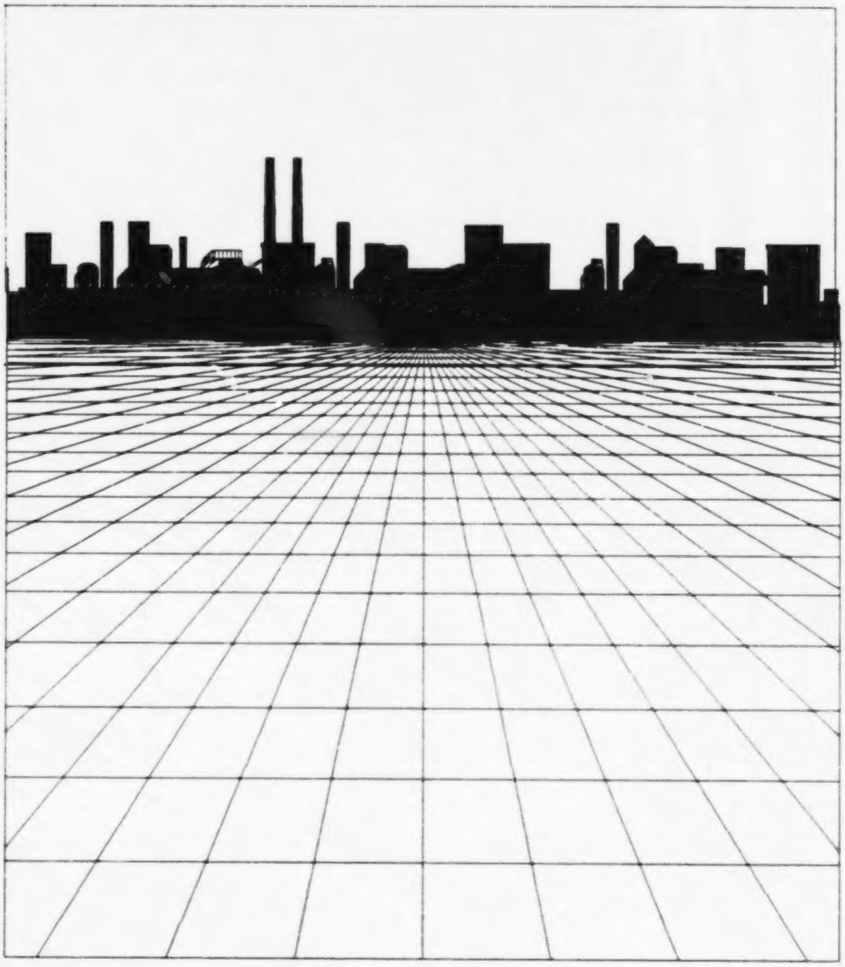
3 states dominated the releases and transfers of the Inorganic Pigments industry.

Table 12-16. Geographical Distribution of TRI Releases and Transfers by Media for the Inorganic Pigments Industry (SIC Code 2816), 1988.

STATE	SIC 2816 RELEASES AND TRANSFERS Pounds	Rank	SIC 28 RELEASES AND TRANSFERS Pounds	Rank
Tennessee	52,691,910	1	144,314,984	4
Missouri	52,510,315	2	81,889,375	10
Mississippi	49,155,550	3	75,189,476	11
Ohio	21,840,080	4	137,666,920	6
New York	20,543,490	5	57,770,393	14
Illinois	16,832,237	6	117,540,084	8
Delaware	2,233,593	7	6,608,960	34
California	1,075,075	8	60,467,957	13
Maryland	672,771	9	7,479,697	33
Wisconsin	534,125	10	7,631,626	32
Pennsylvania	513,398	11	43,168,533	19
New Jersey	138,081	12	109,952,226	9
Georgia	52,919	13	31,843,726	21
Texas	29,251	14	573,982,836	1
Montana	16,116	15	230,466	48
Virginia	14,761	16	121,843,715	7
Kansas	2,000	17	153,924,567	3
Indiana	1,000	18	45,394,713	17
TOTAL	218,856,672		1,776,900,254	

3 facilities accounted for 70% of all releases and transfers for the Inorganic Pigments industry.

Based upon the above analyses, it is clear that three facilities out of the 48 in the Inorganic Pigments industry were responsible for the majority (70 percent) of releases and transfers associated with this industry: Du Pont Johnsonville Plant in New Johnsonville, Tennessee; Du Pont Delisle Plant in Pass Christian, Mississippi; and Columbian Chemicals Company in St. Louis, Missouri. It is also noteworthy that these releases and transfers involved very few chemicals of the total number of chemicals released or transferred by facilities in this industrial category.



FUTURE DIRECTIONS FOR THE TOXICS RELEASE INVENTORY

In this year's TRI National Report, EPA has tried to expand the uses of TRI by exploring several areas that were not addressed in the first year's report. These include discussions of health effects data for TRI chemicals, extensive focus on the role of individual facilities, and the inclusion of non-TRI data to lend additional perspective on national and local TRI analyses. National Reports in future years will undoubtedly provide additional means of data analysis and presentation as we continue to appreciate the full measure (and limits) of TRI.

Future reports will differ for another reason as well. TRI is changing. This report has detailed changes—both additions and deletions—to the list of chemicals which must be reported under TRI. In addition, EPA is currently considering several areas of expansion and revision for Toxics Release Inventory reporting. As these come into being, they will provide new types of data which will enter into future analyses and reports. All of the areas discussed below are currently under active review and evaluation at EPA, although the Agency has not yet come to a final decision on any of them.

Peak Release

TRI currently collects data only on *annual* quantities of releases and transfers. Such data masks the patterns of releases during the year: are emissions continual, and released in regular amounts every day? Or do releases happen in a "burst" as the result of a short-term process, or an accidental release? Peak release data will provide information on the maximum amount of air and water releases in a short term (a day or less) period, as well as information on the number of days per year a particular type of release occurs. These data will be particularly useful for extending the type of risk screening/risk assessment analyses discussed earlier in this chapter.

Expansion of the Reporting Universe

Congress created TRI to initially apply only to manufacturers (facilities within SIC codes 20–39) but also granted EPA the authority to expand reporting coverage if deemed necessary. EPA has begun a review of industry sectors currently not required to report, and is considering appropriate protocol for expanding TRI requirements. No decisions have yet been made as to which industries (if any) to include, but some of the categories under review include mining operations, waste management firms, Federal facilities, chemical warehouses, public utilities, photoprocessing firms, and other non-manufacturing users of toxic chemicals.

Expanded and Mandatory Reporting on Pollution Prevention

Pollution prevention is one of EPA's top priorities. It is becoming increasingly clear that the Agency and the public need a reliable source of data on the types of pollution prevention practices in use in industry, and the impact of these practices. One possible means of acquiring such data is through TRI. The current optional question may be made mandatory to ensure reliable and thorough information, and may also be expanded to include more detailed information on the types of processes subject to pollution prevention and the effectiveness of such practices in reducing overall quantities of waste generation.

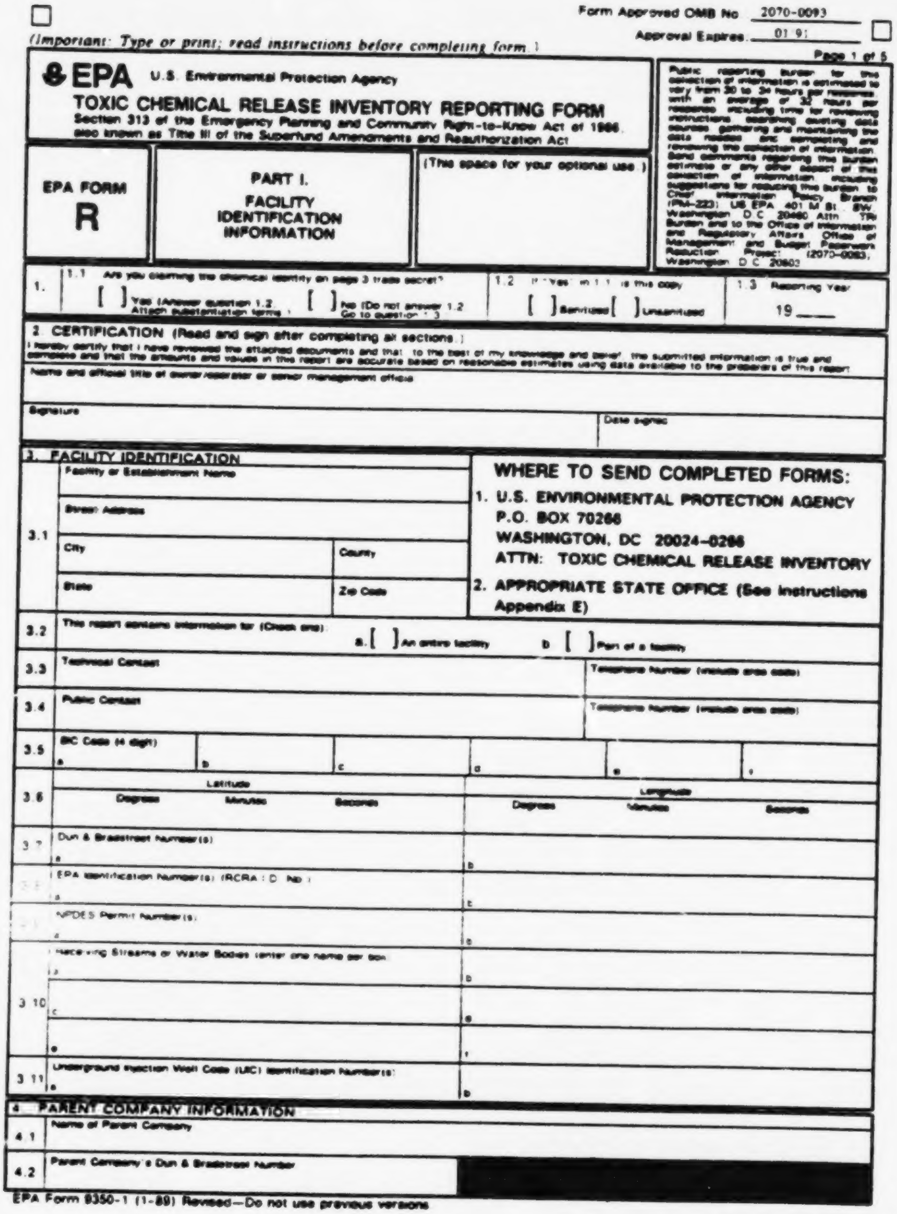
Mass Balance/Materials Accounting Data

When Congress originally created TRI, it did not reach consensus on the question of collecting "mass balance" data. Such data would augment information on *releases* with data on chemical inputs, outputs and storage quantities, to provide a fuller context for the data on releases. Mass balance data is often likened to conventional "cost accounting" data which tracks monetary inputs and outputs. In fact, another term for mass balance is "materials accounting." The National Academy of Sciences is evaluating the utility of the mass balance approach, and will shortly make recommendations to EPA as to what modifications (if any) it suggests for TRI. EPA will take these recommendations into account as it considers the future reporting requirements for TRI.

These changes to TRI will take years to unfold, and will ensure that TRI continues to evolve in response to public concerns over toxic chemicals, industrial concerns about reporting burdens, and the data needs of local, state and federal governments.

PART V

Appendices



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EPA U.S. Environmental Protection Agency

TOXIC CHEMICAL RELEASE INVENTORY REPORTING FORM

Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986, also known as Title III of the Superfund Amendments and Reauthorization Act

Public reporting burden for this collection of information is estimated to vary from 30 to 34 hours per response, with an average of 32 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch (PM-223), US EPA, 401 M St., SW, Washington, D.C. 20460 Attn: TRI Burden, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Paperwork Reduction Project (2070-0093), Washington, D.C. 20503

EPA FORM **R**	**PART I.** **FACILITY IDENTIFICATION INFORMATION**	(This space for your optional use.)

1.	1.1 Are you claiming the chemical identity on page 3 trade secret? [ ] Yes (Answer question 1.2. Attach substantiation forms.) [ ] No (Do not answer 1.2. Go to question 1.3.)	1.2 If "Yes" in 1.1, is this copy [ ] Sanitized [ ] Unsanitized	1.3 Reporting Year 19___

2. CERTIFICATION (Read and sign after completing all sections.)

I hereby certify that I have reviewed the attached documents and that, to the best of my knowledge and belief, the submitted information is true and complete and that the amounts and values in this report are accurate based on reasonable estimates using data available to the preparers of this report.

Name and official title of owner/operator or senior management official

Signature | Date signed

3. FACILITY IDENTIFICATION

3.1	Facility or Establishment Name		
	Street Address		
	City	County	
	State	Zip Code	

WHERE TO SEND COMPLETED FORMS:

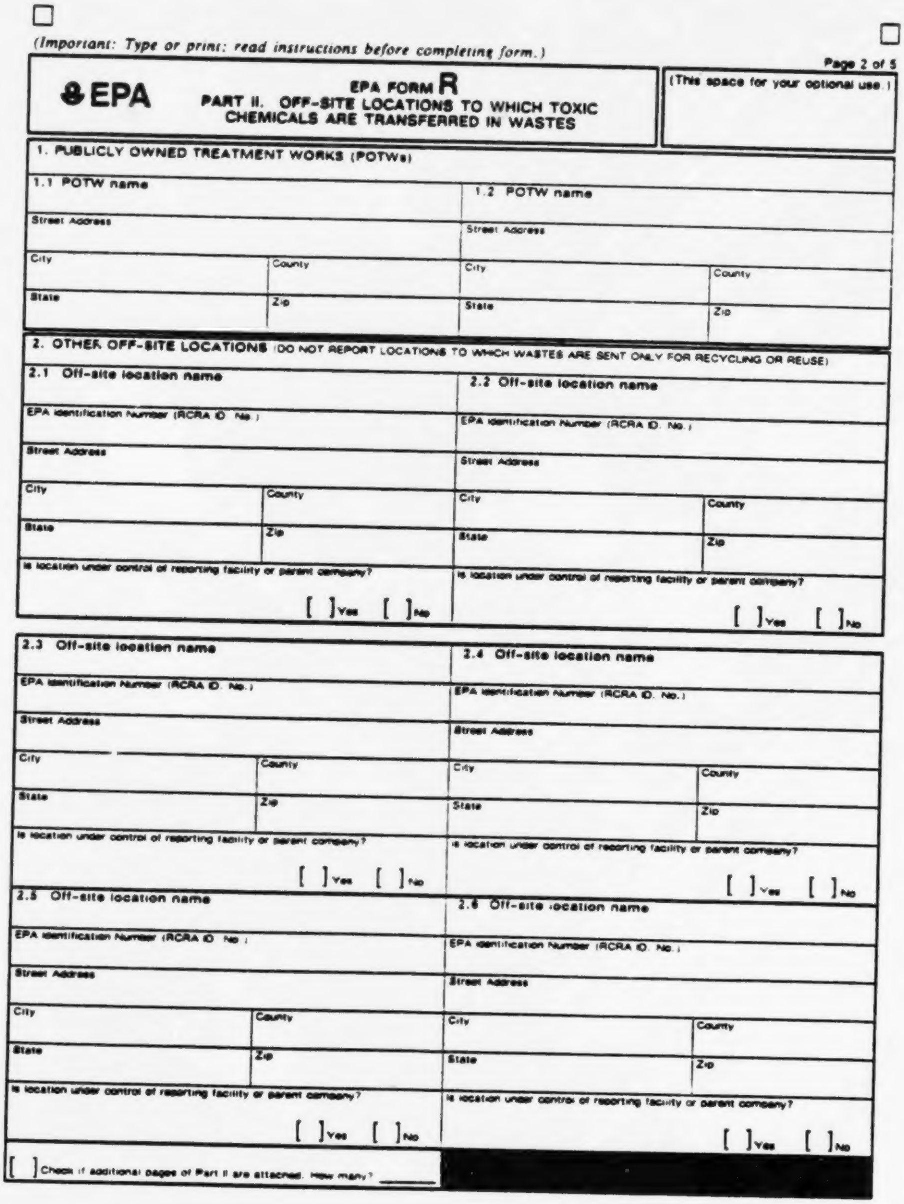
1. U.S. ENVIRONMENTAL PROTECTION AGENCY
P.O. BOX 70266
WASHINGTON, DC 20024-0266
ATTN: TOXIC CHEMICAL RELEASE INVENTORY
2. APPROPRIATE STATE OFFICE (See instructions Appendix E)

3.2	This report contains information for (Check one): a. [ ] An entire facility b. [ ] Part of a facility					
3.3	Technical Contact			Telephone Number (include area code)		
3.4	Public Contact			Telephone Number (include area code)		
3.5	SIC Code (4 digit) a	b	c	d	e	f
3.6	Latitude: Degrees	Minutes	Seconds	Longitude: Degrees	Minutes	Seconds
3.7	Dun & Bradstreet Number(s) a	b				
3.8	EPA Identification Number(s) (RCRA I.D. No.) a	b				
3.9	NPDES Permit Number(s) a	b				
3.10	Receiving Streams or Water Bodies (enter one name per box) a	b				
	c	d				
	e	f				
3.11	Underground Injection Well Code (UIC) Identification Number(s) a	b				

4. PARENT COMPANY INFORMATION

4.1	Name of Parent Company	
4.2	Parent Company's Dun & Bradstreet Number	

EPA Form 9350-1 (1-89) Revised—Do not use previous versions



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(Important: Type or print; read instructions before completing form.)

Page 2 of 5

EPA	EPA FORM R PART II. OFF-SITE LOCATIONS TO WHICH TOXIC CHEMICALS ARE TRANSFERRED IN WASTES	(This space for your optional use.)

1. PUBLICLY OWNED TREATMENT WORKS (POTWs)

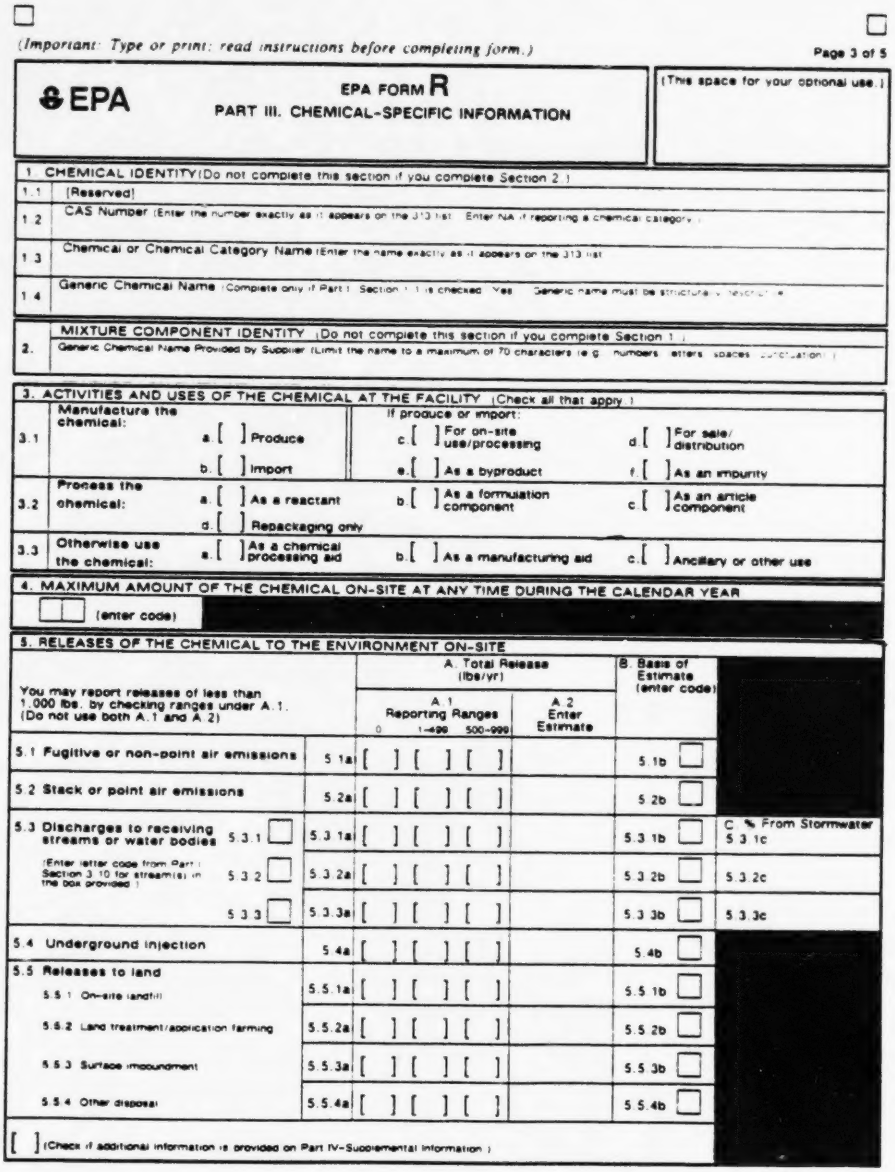
1.1 POTW name		**1.2 POTW name**	
Street Address		Street Address	
City	County	City	County
State	Zip	State	Zip

2. OTHER OFF-SITE LOCATIONS (DO NOT REPORT LOCATIONS TO WHICH WASTES ARE SENT ONLY FOR RECYCLING OR REUSE)

2.1 Off-site location name		**2.2 Off-site location name**	
EPA identification Number (RCRA ID. No.)		EPA identification Number (RCRA ID. No.)	
Street Address		Street Address	
City	County	City	County
State	Zip	State	Zip
Is location under control of reporting facility or parent company? [ ] Yes [ ] No		Is location under control of reporting facility or parent company? [ ] Yes [ ] No	

2.3 Off-site location name		**2.4 Off-site location name**	
EPA identification Number (RCRA ID. No.)		EPA identification Number (RCRA ID. No.)	
Street Address		Street Address	
City	County	City	County
State	Zip	State	Zip
Is location under control of reporting facility or parent company? [ ] Yes [ ] No		Is location under control of reporting facility or parent company? [ ] Yes [ ] No	
2.5 Off-site location name		**2.6 Off-site location name**	
EPA identification Number (RCRA ID. No.)		EPA identification Number (RCRA ID. No.)	
Street Address		Street Address	
City	County	City	County
State	Zip	State	Zip
Is location under control of reporting facility or parent company? [ ] Yes [ ] No		Is location under control of reporting facility or parent company? [ ] Yes [ ] No	

[ ] Check if additional pages of Part II are attached. How many? ______



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(Important: Type or print; read instructions before completing form.)

Page 3 of 5

EPA	EPA FORM R PART III. CHEMICAL-SPECIFIC INFORMATION	(This space for your optional use.)

1. CHEMICAL IDENTITY (Do not complete this section if you complete Section 2.)

1.1	[Reserved]
1.2	CAS Number (Enter the number exactly as it appears on the 313 list. Enter NA if reporting a chemical category.)
1.3	Chemical or Chemical Category Name (Enter the name exactly as it appears on the 313 list.)
1.4	Generic Chemical Name (Complete only if Part I, Section 1.1 is checked "Yes". Generic name must be structurally descriptive.)

2.	**MIXTURE COMPONENT IDENTITY** (Do not complete this section if you complete Section 1.) Generic Chemical Name Provided by Supplier (Limit the name to a maximum of 70 characters (e.g., numbers, letters, spaces, punctuation).)

3. ACTIVITIES AND USES OF THE CHEMICAL AT THE FACILITY (Check all that apply.)

3.1	**Manufacture the chemical:**	a. [ ] Produce b. [ ] Import	If produce or import: c. [ ] For on-site use/processing e. [ ] As a byproduct	d. [ ] For sale/distribution f. [ ] As an impurity
3.2	**Process the chemical:**	a. [ ] As a reactant d. [ ] Repackaging only	b. [ ] As a formulation component	c. [ ] As an article component
3.3	**Otherwise use the chemical:**	a. [ ] As a chemical processing aid	b. [ ] As a manufacturing aid	c. [ ] Ancillary or other use

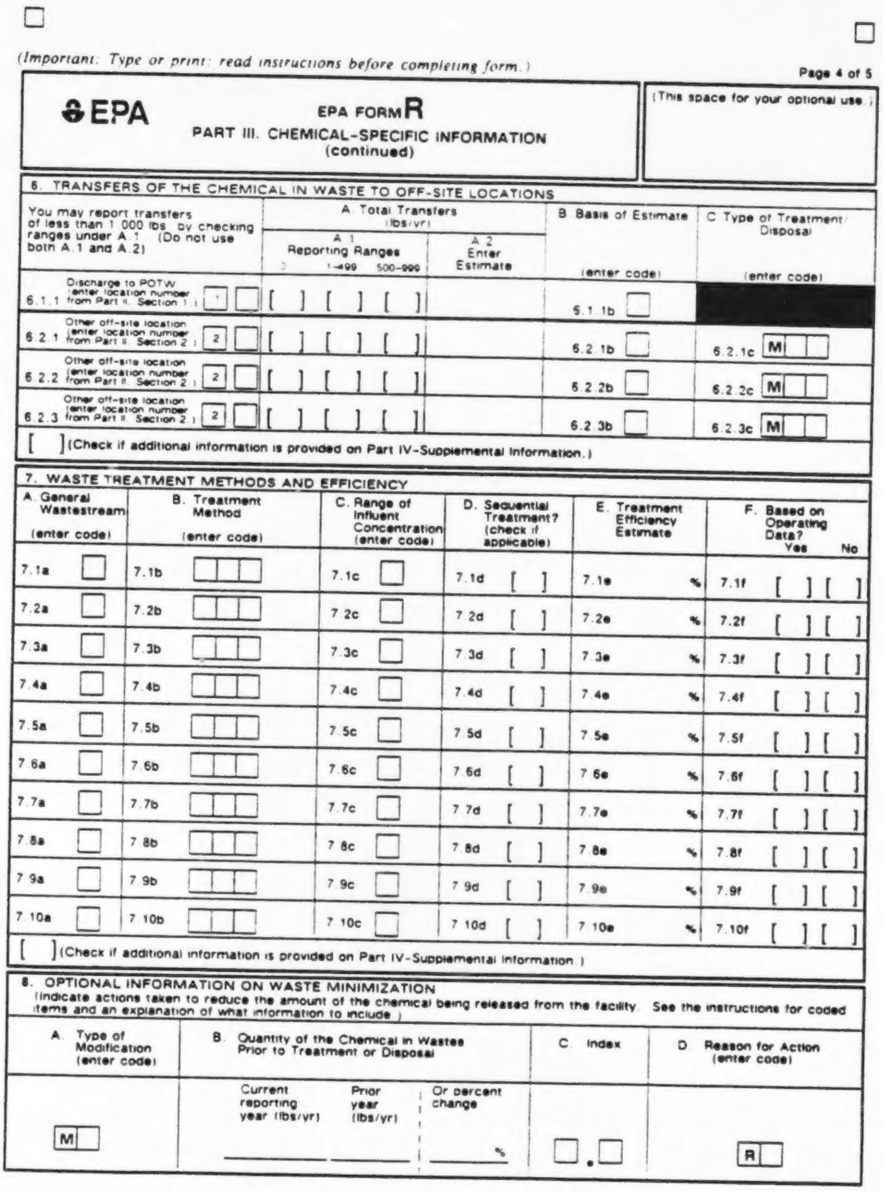
4. MAXIMUM AMOUNT OF THE CHEMICAL ON-SITE AT ANY TIME DURING THE CALENDAR YEAR

☐☐ (enter code)

5. RELEASES OF THE CHEMICAL TO THE ENVIRONMENT ON-SITE

You may report releases of less than 1,000 lbs. by checking ranges under A.1. (Do not use both A.1 and A.2)		A. Total Release (lbs/yr) A.1 Reporting Ranges 0	 1-499	 500-999	 A.2 Enter Estimate	B. Basis of Estimate (enter code)		
5.1 Fugitive or non-point air emissions	5.1a	[ ]	[ ]	[ ]		5.1b	☐	
5.2 Stack or point air emissions	5.2a	[ ]	[ ]	[ ]		5.2b	☐	
5.3 Discharges to receiving streams or water bodies 5.3.1 ☐	5.3.1a	[ ]	[ ]	[ ]		5.3.1b	☐	C. % From Stormwater 5.3.1c
(Enter letter code from Part I Section 3.10 for stream(s) in the box provided.) 5.3.2 ☐	5.3.2a	[ ]	[ ]	[ ]		5.3.2b	☐	5.3.2c
5.3.3 ☐	5.3.3a	[ ]	[ ]	[ ]		5.3.3b	☐	5.3.3c
5.4 Underground injection	5.4a	[ ]	[ ]	[ ]		5.4b	☐	
5.5 Releases to land 5.5.1 On-site landfill	5.5.1a	[ ]	[ ]	[ ]		5.5.1b	☐	
5.5.2 Land treatment/application farming	5.5.2a	[ ]	[ ]	[ ]		5.5.2b	☐	
5.5.3 Surface impoundment	5.5.3a	[ ]	[ ]	[ ]		5.5.3b	☐	
5.5.4 Other disposal	5.5.4a	[ ]	[ ]	[ ]		5.5.4b	☐	

[ ] (Check if additional information is provided on Part IV-Supplemental Information.)



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(Important: Type or print: read instructions before completing form.)

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EPA

EPA FORM **R**

PART III. CHEMICAL-SPECIFIC INFORMATION (continued)

(This space for your optional use.)

6. TRANSFERS OF THE CHEMICAL IN WASTE TO OFF-SITE LOCATIONS

You may report transfers of less than 1,000 lbs. by checking ranges under A.1. (Do not use both A.1 and A.2)		A. Total Transfers (lbs/yr) A.1 Reporting Ranges 0	1-499	500-999	A.2 Enter Estimate	B. Basis of Estimate (enter code)	C. Type of Treatment/Disposal (enter code)
6.1.1 Discharge to POTW (enter location number from Part II, Section 1.)	1 ☐	[ ]	[ ]	[ ]		6.1.1b ☐	
6.2.1 Other off-site location (enter location number from Part II, Section 2.)	2 ☐	[ ]	[ ]	[ ]		6.2.1b ☐	6.2.1c M☐☐
6.2.2 Other off-site location (enter location number from Part II, Section 2.)	2 ☐	[ ]	[ ]	[ ]		6.2.2b ☐	6.2.2c M☐☐
6.2.3 Other off-site location (enter location number from Part II, Section 2.)	2 ☐	[ ]	[ ]	[ ]		6.2.3b ☐	6.2.3c M☐☐

[ ] (Check if additional information is provided on Part IV-Supplemental Information.)

7. WASTE TREATMENT METHODS AND EFFICIENCY

A. General Wastestream (enter code)	B. Treatment Method (enter code)	C. Range of Influent Concentration (enter code)	D. Sequential Treatment? (check if applicable)	E. Treatment Efficiency Estimate	F. Based on Operating Data? Yes	No
7.1a ☐	7.1b ☐☐☐	7.1c ☐	7.1d [ ]	7.1e %	7.1f [ ]	[ ]
7.2a ☐	7.2b ☐☐☐	7.2c ☐	7.2d [ ]	7.2e %	7.2f [ ]	[ ]
7.3a ☐	7.3b ☐☐☐	7.3c ☐	7.3d [ ]	7.3e %	7.3f [ ]	[ ]
7.4a ☐	7.4b ☐☐☐	7.4c ☐	7.4d [ ]	7.4e %	7.4f [ ]	[ ]
7.5a ☐	7.5b ☐☐☐	7.5c ☐	7.5d [ ]	7.5e %	7.5f [ ]	[ ]
7.6a ☐	7.6b ☐☐☐	7.6c ☐	7.6d [ ]	7.6e %	7.6f [ ]	[ ]
7.7a ☐	7.7b ☐☐☐	7.7c ☐	7.7d [ ]	7.7e %	7.7f [ ]	[ ]
7.8a ☐	7.8b ☐☐☐	7.8c ☐	7.8d [ ]	7.8e %	7.8f [ ]	[ ]
7.9a ☐	7.9b ☐☐☐	7.9c ☐	7.9d [ ]	7.9e %	7.9f [ ]	[ ]
7.10a ☐	7.10b ☐☐☐	7.10c ☐	7.10d [ ]	7.10e %	7.10f [ ]	[ ]

[ ] (Check if additional information is provided on Part IV-Supplemental Information.)

8. OPTIONAL INFORMATION ON WASTE MINIMIZATION

(Indicate actions taken to reduce the amount of the chemical being released from the facility. See the instructions for coded items and an explanation of what information to include.)

A. Type of Modification (enter code)	B. Quantity of the Chemical in Wastes Prior to Treatment or Disposal Current reporting year (lbs/yr)	Prior year (lbs/yr)	Or percent change	C. Index	D. Reason for Action (enter code)
M☐	________	________	________ %	☐.☐	R☐

☐ ☐

(Important: Type or print; read instructions before completing form.)

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EPA

EPA FORM R

PART IV. SUPPLEMENTAL INFORMATION

Use this section if you need additional space for answers to questions in Part III.
Number the lines used sequentially from lines in prior sections (e.g. 5.3.4, 6.1.2, 7.11)

(This space for your optional use.)

ADDITIONAL INFORMATION ON RELEASES OF THE CHEMICAL TO THE ENVIRONMENT ON-SITE (Part III, Section 5.3)

You may report releases of less than 1,000 lbs. by checking ranges under A.1. (Do not use both A.1 and A.2)		A. Total Release (lbs/yr)		B. Basis of Estimate	
		A.1 Reporting Ranges 1-499 500-999	A.2 Enter Estimate	(enter code in box provided)	C. % From Stormwater
5.3 Discharges to receiving streams or water bodies 5.3.___ ☐	5.3.___a	[ ] [ ] [ ]		5.3.___b ☐	5.3.___c
(Enter letter code from Part I Section 3.10 for stream(s) in the box provided.) 5.3.___ ☐	5.3.___a	[ ] [ ] [ ]		5.3.___b ☐	5.3.___c
5.3.___ ☐	5.3.___a	[ ] [ ] [ ]		5.3.___b ☐	5.3.___c

ADDITIONAL INFORMATION ON TRANSFERS OF THE CHEMICAL IN WASTE TO OFF-SITE LOCATIONS (Part III, Section 6)

You may report transfers of less than 1,000 lbs. by checking ranges under A.1. (Do not use both A.1 and A.2)	A. Total Transfers (lbs/yr)		B. Basis of Estimate	C. Type of Treatment/ Disposal
	A.1 Reporting Ranges 0 1-499 500-999	A.2 Enter Estimate	(enter code in box provided)	(enter code in box provided)
6.1.___ Discharge to POTW (enter location number from Part II Section 1.) 1 ☐	[ ] [ ] [ ]		6.1.___b ☐	
6.2.___ Other off-site location (enter location number from Part II, Section 2.) 2 ☐	[ ] [ ] [ ]		6.2.___b ☐	6.2.___c M ☐ ☐
6.2.___ Other off-site location (enter location number from Part II, Section 2.) 2 ☐	[ ] [ ] [ ]		6.2.___b ☐	6.2.___c M ☐ ☐
6.2.___ Other off-site location (enter location number from Part II, Section 2.) 2 ☐	[ ] [ ] [ ]		6.2.___b ☐	6.2.___c M ☐ ☐

ADDITIONAL INFORMATION ON WASTE TREATMENT METHODS AND EFFICIENCY (Part III, Section 7)

A. General Wastestream (enter code in box provided)	B. Treatment Method (enter code in box provided)	C. Range of Influent Concentration (enter code)	D. Sequential Treatment? (check if applicable)	E. Treatment Efficiency Estimate	F. Based on Operating Data? Yes No
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]

RANK 1988	CLASS	CAS NO.	CHEMICAL NAME	TOTAL RELEASES AND TRANSFERS	APPLICABLE REGULATIONS	HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARCIN-OGEN
						ACUTE		CHRONIC			ACUTE		CHRN.	
				Pounds		TPQ	RQAH	RQCH	RFDI	RFDO	RQAR	WQCA	WQCC	
36	O	000050000	FORMALDEHYDE	30,766,305	A V	2	2	1	-	-	2	-	-	1
126	O	000051285	2,4-DINITROPHENOL	884,624	P A V	-	2	1	-	-	1	-	-	-
--	O	000051752	NITROGEN MUSTARD	0	V	1	1	-	-	-	-	-	-	1
178	O	000051796	URETHANE	145,733	A V	-	3	-	-	-	-	-	-	1
245	H	000052686	TRICHLORFON	2,034	V	-	3	1	-	-	2	-	-	-
--	O	000053963	2-ACETYLAMINOFLUORENE	0	A V	-	3	-	-	-	-	-	-	1
--	O	000055185	N-NITROSODIETHYLAMINE	0	V	-	3	-	-	-	-	-	-	1
247	O	000055210	BENZAMIDE	1,750	V	-	-	-	-	-	-	-	-	-
192	O	000055630	NITROGLYCERIN	69,655	V	-	-	-	-	-	-	-	-	-
72	H	000056235	CARBON TETRACHLORIDE	5,085,155	P O A V	-	3	1	-	1	2	3	-	1
218	O	000056382	PARATHION	17,386	A V	1	1	1	-	1	1	1	1	-
220	O	000057147	1,1-DIMETHYL HYDRAZINE	13,188	A V	3	2	-	-	-	-	-	-	1
--	O	000057578	BETA-PROPIOLACTONE	0	A V	2	1	-	-	-	-	-	-	1
187	H	000057749	CHLORDANE	85,673	P A V	3	2	-	-	1	1	1	1	-
258	H	000058899	LINDANE	444	P A V	3	2	-	-	1	1	1	1	1
--	O	000059892	N-NITROSOMORPHOLINE	0	A V	-	-	-	-	-	-	-	-	1
254	O	000060093	4-AMINOAZOBENZENE	537	V	-	-	-	-	-	-	-	-	1
--	O	000060117	4-DIMETHYLAMINOAZOBENZENE	0	A V	-	3	-	-	-	-	-	-	1
233	O	000060344	METHYL HYDRAZINE	5,628	A V	2	2	-	-	-	-	-	-	-
261	O	000060355	ACETAMIDE	250	A V	-	-	-	-	-	-	-	-	1
67	O	000062533	ANILINE	7,154,770	A V	3	2	-	-	-	2	-	-	-
252	O	000062555	THIOACETAMIDE	750	V	-	-	-	-	-	3	-	-	1
195	O	000062566	THIOUREA	56,343	V	-	3	-	-	-	-	-	-	1
241	H	000062737	DICHLORVOS	2,526	A V	3	2	-	-	-	1	-	-	-
--	O	000062759	N-NITROSODIMETHYLAMINE	0	P A V	3	2	-	-	-	-	-	-	1
204	O	000063252	CARBARYL	42,501	A V	-	3	-	-	-	1	-	-	-
231	O	000064675	DIETHYL SULFATE	6,965	A V	-	-	-	-	-	-	-	-	1
3	O	000067561	METHANOL	435,639,693	P A V	-	3	-	-	-	3	-	-	-
105	O	000067630	ISOPROPYL ALCOHOL (MANUFACTURING)	1,672,949	V	-	-	-	-	-	-	-	-	1
7	O	000067641	ACETONE	249,703,395	V	-	-	-	-	2	3	-	-	-
38	H	000067663	CHLOROFORM	26,604,039	P A V	3	3	-	-	2	2	3	2	1
141	H	000067721	HEXACHLOROETHANE	530,356	P A V	-	3	2	-	1	1	1	1	-
--	O	000068768	TRIAZIQUONE	0	V	-	-	-	-	-	-	-	-	1
25	O	000071363	N-BUTYL ALCOHOL	52,004,930	V	-	3	-	-	-	-	-	-	-
35	O	000071432	BENZENE	33,245,252	N P A V	-	3	2	-	-	1	2	-	1
11	H	000071556	1,1,1-TRICHLOROETHANE	180,418,488	P O A	-	3	2	-	-	2	-	-	-
159	H	000072435	METHOXYCHLOR	298,150	A V	-	3	-	2	2	1	-	-	-
117	H	000074839	BROMOMETHANE	1,193,117	P A V	3	2	-	-	-	3	-	-	-
30	O	000074851	ETHYLENE	41,422,394	V	-	-	-	-	-	-	-	-	-
58	H	000074873	CHLOROMETHANE	9,322,871	P A	-	3	2	-	-	3	-	-	-
226	H	000074884	METHYL IODIDE	9,449	A V	-	3	-	-	-	-	-	-	1
88	A	000074908	HYDROGEN CYANIDE	3,077,023		1	1	-	-	-	1	-	-	-
197	H	000074953	METHYLENE BROMIDE	51,070	V	-	2	-	-		3	-	-	-
74	H	000075003	CHLOROETHANE	4,849,583	P A V	-	3	-	-	-	3	-	-	-
99	H	000075014	VINYL CHLORIDE	2,072,382	N P A V	-	1	2	-	-	3	-	-	1
39	O	000075058	ACETONITRILE	23,585,619	A V	-	3	2	2	1	3	-	-	1
56	O	000075070	ACETALDEHYDE	10,009,783	A V	-	3	-	-	-	2	-	-	-
14	H	000075092	DICHLOROMETHANE	134,212,442	P A V	-	3	2	-	2	3	-	-	1
17	O	000075150	CARBON DISULFIDE	82,748,299	A V	3	2	1	-	-	3	-	-	-
73	O	000075218	ETHYLENE OXIDE	5,053,707	A V	3	2	-	-	-	2	-	-	1
228	H	000075252	BROMOFORM	8,600	P A V	-	3	1	-	2	2	-	-	-
--	H	000075274	DICHLOROBROMOMETHANE	0	P V	-	3	-	-	-	-	-	-	-
131	H	000075354	VINYLIDENE CHLORIDE	711,956	P A V	-	2	2	-	1	3	-	-	-
212	H	000075445	PHOSGENE	23,857	A V	1	1	-	-	-	3	-	-	-
250	O	000075558	PROPYLENEIMINE	750	A V	3	2	-	-	-	-	-	-	1
77	O	000075569	PROPYLENE OXIDE	4,625,911	A V	3	3	-	-	-	3	-	-	1
82	O	000075650	TERT-BUTYL ALCOHOL	3,818,985	V	-	-	-	-	-	-	-	-	-

RANK 1988	CLASS	CAS NO.	CHEMICAL NAME	TOTAL RELEASES AND TRANSFERS	APPLICABLE REGULATIONS	HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARCINOGEN
						ACUTE		CHRONIC			ACUTE		CHRN.	
				Pounds		TPQ	RQAR	RQCH	RFDI	RFDO	RQAR	WQCA	WQCC	
19	H	000076131	FREON 113	68,545,125	O	-	-	-	-	-	-	-	-	-
185	H	000076448	HEPTACHLOR	101,029	P A V	-	2	-	-	1	1	1	1	-
134	H	000077474	HEXACHLOROCYCLOPENTADIENE	637,022	P A V	1	3	1	1	1	1	1	1	-
222	O	000077781	DIMETHYL SULFATE	12,456	A V	2	1	-	-	-	2	-	-	1
130	O	000078842	ISOBUTYRALDEHYDE	822,969	V	-	-	-	-	-	-	-	-	-
108	H	000078875	1,2-DICHLOROPROPANE	1,536,395	P A V	-	3	-	-	-	3	-	-	-
109	O	000078922	SEC-BUTYL ALCOHOL	1,466,481	V	-	-	-	-	-	-	-	-	-
12	O	000078933	METHYL ETHYL KETONE	156,490,232	A V	-	3	2	-	-	3	-	-	-
102	H	000079005	1,1,2-TRICHLOROETHANE	2,003,286	A V	-	3	-	-	1	2	-	2	-
24	H	000079016	TRICHLOROETHYLENE	52,616,792	P A V	-	3	2	-	-	2	3	3	-
123	O	000079061	ACRYLAMIDE	1,032,887	A V	3	3	-	-	-	-	-	-	1
40	O	000079107	ACRYLIC ACID	23,359,031	A V	-	3	-	-	-	-	-	-	-
201	H	000079118	CHLOROACETIC ACID	46,062	A V	1	2	1	-	1	-	-	-	-
234	O	000079210	PERACETIC ACID	5,508	V	2	2	-	-	-	-	-	-	-
170	H	000079345	1,1,2,2-TETRACHLOROETHANE	199,592	P A V	-	3	2	-	-	1	-	2	1
--	O	000079447	DIMETHYLCARBAMYL CHLORIDE	0	A V	-	3	-	-	-	-	-	-	1
133	O	000079469	2-NITROPROPANE	664,866	A V	-	2	-	-	-	-	-	-	1
115	O	000080057	4,4'-ISOPROPYLIDENEDIPHENOL	1,260,344	V	-	-	-	-	-	-	-	-	-
136	O	000080159	CUMENE HYDROPEROXIDE	597,323	V	-	2	-	-	-	-	-	-	-
68	O	000080626	METHYL METHACRYLATE	7,043,579	A V	-	3	2	-	-	3	-	-	-
227	O	000081072	SACCHARIN (MANUFACTURING)	9,400	V	-	-	-	-	-	-	-	-	1
262	O	000081889	C.I. FOOD RED 15	250	V	-	-	-	-	-	-	-	-	1
--	O	000082280	1-AMINO-2-METHYLANTHRAQUINONE	0	V	-	-	-	-	-	-	-	-	1
219	O	000082688	QUINTOZENE	13,939	A V	-	3	2	-	-	-	-	-	-
165	O	000084662	DIETHYL PHTHALATE	241,102	P V	-	3	3	-	-	2	-	-	-
127	O	000084742	DIBUTYL PHTHALATE	883,490	P A V	-	3	2	-	-	1	-	-	-
65	O	000085449	PHTHALIC ANHYDRIDE	7,275,031	A V	-	3	-	-	-	-	-	-	-
111	O	000085687	BUTYL BENZYL PHTHALATE	1,380,584	P V	-	-	-	-	2	1	-	-	-
207	O	000086306	N-NITROSODIPHENYLAMINE	34,327	P V	-	3	-	-	-	1	-	-	-
246	O	000087627	2,6-XYLIDINE	1,874	V	-	-	-	-	-	-	-	-	-
85	H	000087683	HEXACHLORO-1,3-BUTADIENE	3,535,870	P A V	-	2	2	-	1	1	1	1	-
84	H	000087865	PENTACHLOROPHENOL	3,549,662	P A V	-	1	2	-	2	1	1	1	-
223	H	000088062	2,4,6-TRICHLOROPHENOL	12,310	P A V	-	3	-	-	-	1	-	1	1
171	O	000088755	2-NITROPHENOL	107,392	P V	-	3	-	-	-	1	-	-	-
113	O	000088891	PICRIC ACID	1,314,753	V	-	-	-	-	-	-	-	-	-
237	O	000090040	O-ANISIDINE	3,599	A V	-	-	-	-	-	-	-	-	1
216	O	000090437	2-PHENYLPHENOL	17,760	V	-	-	-	-	-	-	-	-	-
206	O	000090948	MICHLER'S KETONE	34,619	V	-	-	-	-	-	-	-	-	1
174	O	000091087	TOLUENE-2,6-DIISOCYANATE	181,262	V	1	-	-	-	-	-	-	-	1
70	O	000091203	NAPHTHALENE	6,662,672	P A V	-	3	-	-	2	1	2	1	-
193	O	000091225	QUINOLINE	68,341	A V	-	3	-	-	-	2	-	-	-
--	O	000091598	BETA-NAPHTHYLAMINE	0	V	-	3	-	-	-	1	-	-	1
167	H	000091941	3,3'-DICHLOROBENZIDINE	225,829	A V	-	3	-	-	-	-	-	-	1
87	O	000092524	BIPHENYL	3,262,894	V	-	-	-	-	-	-	-	-	-
266	O	000092671	4-AMINOBIPHENYL	14	A V	-	-	-	-	-	-	-	-	1
--	O	000092875	BENZIDINE	0	P A V	-	3	1	-	1	1	2	-	1
--	O	000092933	4-NITROBIPHENYL	0	A V	-	-	-	-	-	-	-	-	1
175	O	000094360	BENZOYL PEROXIDE	179,644	V	-	-	-	-	-	-	-	-	-
251	O	000094597	SAFROLE	750	V	-	3	-	-	-	-	-	-	1
179	H	000094757	2,4-D (ACETIC ACID)	143,067	A V	-	-	-	-	-	-	-	-	-
91	O	000095476	O-XYLENE	2,928,235	A V	-	-	-	-	-	-	-	-	-
168	O	000095487	O-CRESOL	222,144	A V	3	-	-	-	2	-	-	-	-
94	H	000095501	1,2-DICHLOROBENZENE	2,470,161	P V	-	3	2	2	2	1	-	-	-
184	O	000095534	O-TOLUIDINE	101,440	A V	-	3	-	-	-	-	-	-	1
76	O	000095636	1,2,4-TRIMETHYLBENZENE	4,688,815	V	-	-	-	-	-	-	-	-	-
236	O	000095807	2,4-DIAMINOTOLUENE	4,438	A V	-	3	-	-	-	-	-	-	1
265	H	000095954	2,4,5-TRICHLOROPHENOL	110	A V	-	3	2	-	-	1	-	-	-
239	O	000096093	STYRENE OXIDE	3,314	A V	-	-	-	-	-	-	-	-	1
--	H	000096128	1,2-DIBROMO-3-CHLOROPROPANE	0	A V	-	2	-	-	-	-	-	-	1

RANK 1988	CLASS	CAS NO.	CHEMICAL NAME	TOTAL RELEASES AND TRANSFERS	APPLICABLE REGULATIONS	HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARCINOGEN
						ACUTE		CHRONIC			ACUTE		CHRN.	
				Pounds		TPQ	RQAR	RQCH	RFDI	RFDO	RQAR	WQCA	WQCC	
143	O	000096333	METHYL ACRYLATE	495,973	V	-	-	-	-	-	-	-	-	-
238	O	000096457	ETHYLENE THIOUREA	3,500	A V	-	-	-	-	-	3	-	-	1
263	O	000097563	C.I. SOLVENT YELLOW 3	250	V	-	-	-	-	-	-	-	-	1
199	H	000098077	BENZOIC TRICHLORIDE	47,535	V	1	2	-	-	-	-	-	-	1
75	O	000098828	CUMENE	4,717,001	A V	-	3	-	-	-	-	-	-	-
182	H	000098873	BENZAL CHLORIDE	108,444	V	2	3	-	-	-	-	-	-	-
142	H	000098884	BENZOYL CHLORIDE	526,329	V	-	-	-	-	-	2	-	-	-
97	O	000098953	NITROBENZENE	2,243,116	P A V	3	3	-	1	1	2	3	-	-
--	O	000099592	5-NITRO-O-ANISIDINE	0	V	-	-	-	-	-	-	-	-	1
139	O	000100027	4-NITROPHENOL	574,660	P A V	-	3	-	-	-	1	-	-	-
71	O	000100210	TEREPHTHALIC ACID	6,623,278	V	-	-	-	-	-	-	-	-	-
54	O	000100414	ETHYLBENZENE	10,409,714	P A V	-	3	3	-	2	2	3	-	-
27	O	000100425	STYRENE	42,760,770	A V	-	3	-	-	-	2	-	-	1
173	H	000100447	BENZYL CHLORIDE	184,370	V	2	2	-	-	-	1	-	-	-
--	O	000100754	N-NITROSOPIPERIDINE	0	V	-	3	-	-	-	-	-	-	1
230	H	000101144	4,4'-METHYLENEBIS(2-CHLORO ANILINE	7,000	A V	-	-	-	-	-	-	-	-	1
229	O	000101611	4,4'-METHYLENEBIS(N,N-DIMETHYL)	8,400	V	-	-	-	-	-	-	-	-	1
98	O	000101688	METHYLENEBIS(PHENYLISOCYANATE)	2,196,828	A V	-	-	-	-	-	-	-	-	-
125	O	000101779	4,4'-METHYENEDIANILINE	902,504	A V	-	-	-	-	-	-	-	-	1
249	O	000101804	4,4'-DIAMINODIPHENYL ETHER	1,122	V	-	-	-	-	-	-	-	-	1
160	O	000103231	BIS(2-ETHYLHEXYL) ADIPATE	296,852	V	-	-	-	-	-	-	-	-	1
255	O	000104949	P-ANISIDINE	510	V	-	-	-	-	-	-	-	-	-
205	O	000105679	2,4-DIMETHYLPHENOL	38,606	P V	-	3	-	-	-	1	2	-	-
62	O	000106423	P-XYLENE	7,683,788	A V	-	-	-	-	-	-	-	-	-
106	O	000106445	P-CRESOL	1,627,975	A V	-	-	-	-	2	-	-	-	-
101	H	000106467	1,4-DICHLOROBENZENE	2,007,383	P A V	-	3	2	2	-	1	-	-	1
164	O	000106503	P-PHENYLENEDIAMINE	243,632	A V	-	-	-	-	-	-	-	-	-
224	O	000106514	QUINONE	11,720	A V	-	3	-	-	-	1	-	-	-
154	O	000106887	1,2-BUTYLENE OXIDE	353,587	A V	-	-	-	-	-	-	-	-	-
137	H	000106898	EPICHLOROHYDRIN	582,393	A V	3	2	1	-	-	2	-	-	1
186	H	000106934	1,2-DIBROMOETHANE	96,993	A V	-	2	-	-	-	2	-	-	1
66	O	000106990	1,3-BUTADIENE	7,212,227	A V	-	-	-	-	-	-	-	-	1
183	O	000107028	ACROLEIN	103,568	P A V	2	1	-	-	-	1	1	1	-
157	H	000107051	ALLYL CHLORIDE	312,842	A V	-	2	-	-	-	2	-	-	-
63	H	000107062	1,2-DICHLOROETHANE	7,567,049	P A V	-	3	2	-	-	3	1	3	1
52	O	000107131	ACRYLONITRILE	10,841,495	P A V	3	2	1	-	-	1	2	2	1
22	O	000107211	ETHYLENE GLYCOL	55,713,223	A V	-	-	-	-	3	-	-	-	-
264	H	000107302	CHLOROMETHYL METHYL ETHER	122	A V	1	2	1	-	-	3	-	-	1
51	O	000108054	VINYL ACETATE	11,552,902	A V	3	3	-	-	-	2	-	-	-
28	O	000108101	METHYL ISOBUTYL KETONE	42,704,420	A V	-	3	-	2	2	-	-	-	-
93	O	000108316	MALEIC ANHYDRIDE	2,551,667	A V	-	3	-	-	-	3	-	-	-
83	O	000108383	M-XYLENE	3,560,624	A V	-	-	-	-	-	-	-	-	-
176	O	000108394	M-CRESOL	164,825	A V	-	-	-	-	2	-	-	-	-
209	H	000108601	BIS(2-CHLORO-1-METHYLETHYL)ETHER	31,140	P V	-	3	2	-	-	-	-	-	-
--	O	000108781	MELAMINE	0	V	-	-	-	-	-	-	-	-	-
6	O	000108883	TOLUENE	333,315,437	P A V	-	3	2	-	-	2	-	-	-
57	H	000108907	CHLOROBENZENE	9,739,652	P A V	-	3	2	1	2	1	-	-	-
37	O	000108952	PHENOL	28,626,202	P A V	2	3	2	-	2	2	3	2	-
64	O	000109864	2-METHOXYETHANOL	7,315,049	V	-	-	-	1	1	-	-	-	-
89	O	000110805	2-ETHOXYETHANOL	3,045,093	V	-	3	2	2	2	3	-	-	-
48	O	000110827	CYCLOHEXANE	14,924,283	V	-	3	-	-	-	2	-	-	-
120	O	000110861	PYRIDINE	1,082,765	V	-	3	1	-	-	3	-	-	-
79	O	000111422	DIETHANOLAMINE	4,478,996	A V	-	-	-	-	-	-	-	-	-
203	H	000111444	BIS(2-CHLOROETHYL) ETHER	43,159	P A V	3	2	-	-	-	3	-	-	-
257	O	000114261	PROPOXUR	500	A V	-	-	-	-	-	-	-	-	-
41	O	000115071	PROPYLENE	23,350,506	V	-	-	-	-	-	-	-	-	-
210	H	000115322	DICOFOL	26,493	V	-	3	-	-	-	1	-	-	-
--	O	000117793	2-AMINOATHRAQUINONE	0	V	-	-	-	-	-	-	-	-	1
86	O	000117817	DI-(2-ETHYLHEXYL) PHTHALATE	3,506,080	P A V	-	3	-	-	-	-	-	-	1

RANK 1988	CLASS	CAS NO.	CHEMICAL NAME	TOTAL RELEASES AND TRANSFERS	APPLICABLE REGULATIONS			HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARCINOGEN
								ACUTE		CHRONIC			ACUTE		CHRN.	
				Pounds				TPQ	RQAA	RQCH	RFDI	RFDO	RQAA	WQCA	WQCC	
162	0	000117840	N-DIOCTYL PHTHALATE	296,468	P		V	-	-	-	-	-	-	-	-	-
124	H	000118741	HEXACHLOROBENZENE	970,287	P	A	V	-	3	1	-	1	-	-	-	1
--	0	000119904	3,3'-DIMETHOXYBENZIDINE	0		A	V	-	3	-	-	-	-	-	-	1
--	0	000119937	3,3'-DIMETHYLBENZIDINE	0		A	V	-	3	-	-	-	-	-	-	1
148	0	000120127	ANTHRACENE	437,542	P		V	-	-	-	-	-	-	-	-	-
198	0	000120718	P-CRESIDINE	50,530			V	-	-	-	-	-	-	-	-	1
103	0	000120809	CATECHOL	1,838,183		A	V	-	-	-	-	-	-	-	-	-
90	H	000120821	1,2,4-TRICHLOROBENZENE	2,962,563	P	A	V	-	3	2	1	2	-	-	-	-
208	H	000120832	2,4-DICHLOROPHENOL	32,127	P		V	-	3	2	-	1	1	2	1	-
121	0	000121142	2,4-DINITROTOLUENE	1,051,965	P	A	V	-	3	1	-	-	2	-	-	-
128	0	000121697	N,N-DIMETHYLANILINE	872,776		A	V	-	-	-	-	-	-	-	-	-
--	0	000122667	1,2-DIPHENYLHYDRAZINE	0	P	A	V	-	3	1	-	-	1	1	-	1
116	0	000123319	HYDROQUINONE	1,213,422		A	V	2	3	2	-	2	-	-	-	-
122	0	000123386	PROPIONALDEHYDE	1,050,657		A	V	-	-	-	-	-	-	-	-	-
95	0	000123728	BUTYRALDEHYDE	2,332,220			V	-	-	-	-	-	-	-	-	-
119	0	000123911	1,4-DIOXANE	1,092,862		A	V	-	3	-	-	-	3	-	-	1
--	H	000126727	TRIS(2,3-DIBROMOPROPYL) PHOSPHATE	0			V	-	3	-	-	-	-	-	-	1
112	H	000126998	CHLOROPRENE	1,363,891		A	V	-	-	-	-	-	-	-	-	-
32	H	000127184	TETRACHLOROETHYLENE	35,879,858	P	A	V	-	3	2	-	-	2	-	-	1
--	0	000128665	C.I. VAT YELLOW 4	0			V	-	-	-	-	-	-	-	-	-
129	0	000131113	DIMETHYL PHTHALATE	855,192	P	A	V	-	3	-	-	-	-	-	-	-
152	0	000132649	DIBENZOFURAN	367,647		A	V	-	-	-	-	-	-	-	-	-
200	0	000133062	CAPTAN	46,264		A	V	-	3	2	-	-	1	-	-	-
240	H	000133904	CHLORAMBEN	2,827		A	V	-	-	-	-	-	-	-	-	-
--	H	000134292	O-ANISIDINE HYDROCHLORIDE	0			V	-	-	-	-	-	-	-	-	1
253	0	000134327	ALPHA-NAPHTHYLAMINE	691			V	-	3	-	-	-	1	-	-	1
232	0	000135206	CUPFERRON	5,975			V	-	-	-	-	-	-	-	-	1
145	0	000139139	NITRILOTRIACETIC ACID	473,163			V	-	-	-	-	-	-	-	-	1
--	0	000139651	4,4'-THIODIANILINE	0			V	-	-	-	-	-	-	-	-	1
151	0	000140885	ETHYL ACRYLATE	388,335		A	V	-	3	-	-	-	3	-	-	1
110	0	000141322	BUTYL ACRYLATE	1,402,350			V	-	-	-	-	-	-	-	-	-
256	0	000151564	ETHYLENEIMINE	500		A	V	2	1	-	-	-	-	-	-	1
244	0	000156105	P-NITROSODIPHENYLAMINE	2,195			V	-	-	-	-	-	-	-	-	1
189	0	000156627	CALCIUM CYANAMIDE	78,600		A	V	-	-	-	-	-	-	-	-	-
191	H	000302012	HYDRAZINE	74,808		A		3	-	-	-	-	-	-	-	1
--	H	000309002	ALDRIN	0	P		V	2	2	-	-	1	1	1	-	-
--	0	000334883	DIAZOMETHANE	0		A	V	-	-	-	-	-	-	-	-	-
67	0	000463581	CARBONYL SULFIDE	19,125,985		A	V	-	-	-	-	-	-	-	-	-
--	0	000492808	C.I. SOLVENT YELLOW 34	0			V	-	-	-	-	-	-	-	-	1
--	0	000505602	MUSTARD GAS	0			V	2	1	1	-	-	-	-	-	1
--	H	000510156	CHLOROBENZILATE	0		A	V	-	3	-	-	-	-	-	-	-
--	H	000532274	2-CHLOROACETOPHENONE	0		A	V	-	-	-	-	-	-	-	-	-
158	0	000534521	4,6-DINITRO-O-CRESOL	306,657	P	A	V	1	1	1	-	-	1	-	-	-
155	H	000540590	1,2-DICHLOROETHYLENE	318,200	P		V	-	-	-	-	-	-	-	-	-
188	H	000541413	ETHYL CHLOROFORMATE	83,503			V	-	-	-	-	-	-	-	-	-
190	H	000541731	1,3-DICHLOROBENZENE	75,949	P		V	-	-	2	-	-	1	-	-	-
196	H	000542756	1,3-DICHLOROPROPYLENE	60,488		A	V	-	3	1	-	-	1	-	-	1
267	H	000542881	BIS(CHLOROMETHYL) ETHER	1		A	V	1	1	-	-	-	-	-	-	1
263	0	000569642	C.I. BASIC GREEN 4	2,320			V	-	-	-	-	-	-	-	-	-
149	0	000584849	TOLUENE-2,4-DIISOCYANATE	430,232		A	V	2	1	-	-	-	1	-	-	1
235	H	000593602	VINYL BROMIDE	5,350		A	V	-	-	-	-	-	-	-	-	1
156	0	000606202	2,6-DINITROTOLUENE	316,878	P		V	-	3	1	-	-	2	-	-	-
259	0	000615054	2,4-DIAMINOANISOLE	250			V	-	-	-	-	-	-	-	-	1
--	0	000621647	N-NITROSODI-N-PROPYLAMINE	0	P		V	-	3	-	-	-	-	-	-	1
215	0	000624839	METHYL ISOCYANATE	18,703		A	V	2	1	-	-	-	-	-	-	-
--	H	000636215	O-TOLUIDINE HYDROCHLORIDE	0			V	-	3	-	-	-	-	-	-	1
--	0	000680319	HEXAMETHYLPHOSPHORAMIDE	0		A	V	-	-	-	-	-	-	-	-	1
--	0	000684935	N-NITROSO-N-METHYLUREA	0		A	V	-	3	-	-	-	-	-	-	1
--	0	000759739	N-NITROSO-N-ETHYLUREA	0			V	-	3	-	-	-	-	-	-	1

RANK 1988	CLASS	CAS NO.	CHEMICAL NAME	TOTAL RELEASES AND TRANSFERS	APPLICABLE REGULATIONS	HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARCINOGEN
						ACUTE		CHRONIC			ACUTE	CHRN.		
				Pounds		TPQ	RQAR	RQCR	RFDI	RFDO	RQAR	WQCA	WQCC	
--	O	000842079	C.I. SOLVENT YELLOW 14	0	V	-	-	-	-	-	-	-	-	1
--	O	000924163	N-NITROSODI-N-BUTYLAMINE	0	V	-	3	-	-	-	-	-	-	1
217	M	000961115	TETRACHLORVINPHOS	17,533	V	-	-	-	-	-	-	-	-	-
--	O	000989388	C.I. BASIC RED 1	0	V	-	-	-	-	-	-	-	-	1
163	O	001120714	PROPANE SULTONE	263,000	A V	-	3	-	-	-	-	-	-	1
132	M	001163195	DECABROMODIPHENYL OXIDE	693,611	V	-	-	-	-	-	-	-	-	-
--	A	001310732	SODIUM HYDROXIDE (SOLUTION)	0		-	3	-	-	-	2	-	-	-
118	M	001313275	MOLYBDENUM TRIOXIDE	1,144,265		-	-	-	-	-	-	-	-	-
138	M	001314201	THORIUM DIOXIDE	578,052		-	-	-	-	-	-	-	-	-
80	O	001319773	CRESOL (MIXED ISOMERS)	4,176,089	A V	-	3	1	-	-	1	-	-	-
10	O	001330207	XYLENE (MIXED ISOMERS)	181,771,506	A V	-	3	-	-	-	2	-	-	-
42	M	001332214	ASBESTOS (FRIABLE)	22,607,674	W P A	-	-	1	-	-	-	-	-	1
--	M	001335871	HEXACHLORONAPHTHALENE	0	V	-	-	-	-	-	-	-	-	-
59	M	001336363	POLYCHLORINATED BIPHENYLS (PCBs)	9,286,906	P A V	-	-	-	-	-	1	1	1	1
--	M	001344281	ALUMINUM OXIDE	0		-	-	-	-	-	-	-	-	-
--	O	001464535	DIEPOXYBUTANE	0	V	2	2	-	-	-	-	-	-	1
172	O	001582098	TRIFLURALIN	194,545	A V	-	-	-	-	-	-	-	-	-
92	O	001634044	METHYL TERT-BUTYL ETHER	2,904,960	A V	-	-	-	-	-	-	-	-	-
--	O	001836755	NITROFEN	0	V	-	-	-	-	-	-	-	-	1
150	M	001897456	CHLOROTHALONIL	429,201	V	-	-	-	-	-	-	-	-	-
--	O	001937377	C.I. DIRECT BLACK 38	0	V	-	-	-	-	-	-	-	-	1
211	O	002164172	FLUOMETURON	25,600	V	-	-	-	-	-	-	-	-	-
--	M	002234131	OCTOCHLORONAPHTHALENE	0	V	-	-	-	-	-	-	-	-	-
--	O	002303164	DIALLATE	0	V	-	3	-	-	-	-	-	-	-
--	O	002602462	C.I. DIRECT BLUE 6	0	V	-	-	-	-	-	-	-	-	1
--	O	002650182	C.I. ACID BLUE 9, DIAMMONIUM SALT	0	V	-	-	-	-	-	-	-	-	-
248	O	002832408	C.I. DISPERSE YELLOW 3	1,599	V	-	-	-	-	-	-	-	-	-
--	O	003118976	C.I. SOLVENT ORANGE 7	0	V	-	-	-	-	-	-	-	-	-
--	O	003761533	C.I. FOOD RED 5	0	V	-	-	-	-	-	-	-	-	1
--	O	003844459	C.I. ACID BLUE 9, DISODIUM SALT	0	V	-	-	-	-	-	-	-	-	-
--	O	004549400	N-NITROSOMETHYLVINYLAMINE	0	V	-	2	-	-	-	-	-	-	1
--	O	004680788	C.I. ACID GREEN 3	0	V	-	-	-	-	-	-	-	-	-
16	A	006484522	AMMONIUM NITRATE (SOLUTION)	107,223,350		-	-	-	-	-	-	-	-	-
29	M	007429905	ALUMINUM (FUME OR DUST)	42,077,299		-	-	-	-	-	-	-	-	-
43	M	007439921	LEAD	22,434,784	P	-	3	-	-	-	-	1	1	1
26	M	007439965	MANGANESE	44,155,819		-	-	-	1	2	-	-	-	-
161	M	007439976	MERCURY	296,679	W P	-	1	-	-	1	1	1	1	-
60	M	007440020	NICKEL	8,999,971	P	-	1	1	-	2	-	2	1	1
181	M	007440224	SILVER	119,057	P	-	3	2	-	-	-	1	1	-
--	M	007440280	THALLIUM	0	P	-	2	-	-	1	-	2	1	-
96	M	007440360	ANTIMONY	2,305,775	P	-	-	-	-	1	-	2	2	-
166	M	007440382	ARSENIC	238,229	W P	-	-	-	-	1	-	-	-	1
61	M	007440393	BARIUM	7,966,771		-	-	-	1	2	-	-	-	-
202	M	007440417	BERYLLIUM	44,249	W P	-	-	-	-	1	2	1	1	1
147	M	007440439	CADMIUM	451,065	P	-	3	-	-	1	-	1	1	1
44	M	007440473	CHROMIUM	21,296,563	P	-	-	-	-	-	-	-	-	1
144	M	007440484	COBALT	475,393		-	-	-	-	-	-	-	-	-
33	M	007440508	COPPER	34,566,659	P	-	-	-	-	3	-	1	1	-
169	M	007440622	VANADIUM (FUME OR DUST)	203,738		-	-	-	-	1	-	-	-	-
20	M	007440666	ZINC (FUME OR DUST)	66,013,145	P	-	-	2	-	2	-	1	1	-
104	M	007550450	TITANIUM TETRACHLORIDE	1,745,713	A	1	1	1	-	-	-	-	-	-
2	A	007647010	HYDROCHLORIC ACID	635,720,989	A	2	3	-	-	-	3	-	-	-
8	A	007664382	PHOSPHORIC ACID	241,602,716		-	3	-	-	-	3	-	-	-
46	A	007664393	HYDROGEN FLUORIDE	19,917,599	A	1	2	1	-	-	3	-	-	-
5	M	007664417	AMMONIA	356,101,165	A	2	3	2	2	3	1	-	-	-
4	A	007664939	SULFURIC ACID	386,060,541		3	2	-	-	-	2	-	-	-
18	A	007697372	NITRIC ACID	81,288,357		3	2	-	-	-	2	-	-	-
81	M	007723140	PHOSPHORUS (YELLOW OR WHITE)	3,970,179	A	1	2	-	-	-	1	-	-	-
--	A	007757826	SODIUM SULFATE (SOLUTION)	0		-	-	-	-	-	-	-	-	-

RANK 1988	CLASS	CAS NO.	CHEMICAL NAME	TOTAL RELEASES AND TRANSFERS	APPLICABLE REGULATIONS			HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARCINOGEN
								ACUTE		CHRONIC			ACUTE		CHRN.	
				Pounds				TPQ	RQAH	RQCH	RFDI	RFDO	RQAR	WQCA	WQCC	
177	M	007782492	SELENIUM	152,160	P			-	1	-	1	1	-	1	1	-
13	M	007782505	CHLORINE	147,050,483		A		1	2	-	-	-	1	1	1	-
1	A	007783202	AMMONIUM SULFATE (SOLUTION)	745,528,007				-	-	-	-	-	-	-	-	-
--	M	008001352	TOXAPHENE	0	P	A	V	2	2	2	-	-	1	1	1	1
153	A	010034932	HYDRAZINE SULFATE	356,172				-	-	-	-	-	-	-	-	-
50	M	010049044	CHLORINE DIOXIDE	13,561,237				-	-	-	-	-	-	-	-	-
221	M	012122677	ZINEB	12,700				-	-	-	-	-	-	-	-	-
225	M	012427382	MANEB	11,347				-	-	-	-	-	-	-	-	-
--	M	016071866	C.I. DIRECT BROWN 95	0				-	-	-	-	-	-	-	-	1
--	O	016543558	N-NITROSONORNICOTINE	0			V	-	-	-	-	-	-	-	-	1
--	M	020816120	OSMIUM TETROXIDE	0				-	2	-	-	-	-	-	-	-
146	M	025321226	DICHLOROBENZENE (MIXED ISOMERS)	470,765			V	-	-	2	-	-	1	2	1	1
135	O	025376458	DIAMINOTOLUENE (MIXED ISOMERS)	620,910			V	-	3	-	-	-	-	-	-	1
260	O	039156417	2,4-DIAMINOANISOLE SULFATE	250			V	-	-	-	-	-	-	-	-	1
78	M		ANTIMONY COMPOUNDS	4,603,260	P	A		2	1	1	-	1	2	2	2	-
69	M		ARSENIC COMPOUNDS	7,020,945	H P	A		1	1	1	-	1	1	1	1	-
45	M		BARIUM COMPOUNDS	21,172,971				-	-	-	1	2	-	-	-	-
214	M		BERYLLIUM COMPOUNDS	21,423	H P	A		-	2	1	-	1	2	1	1	-
107	M		CADMIUM COMPOUNDS	1,571,920	P	A		1	1	1	-	1	1	1	1	-
100	M		CHLOROPHENOLS	2,047,961	P		V	-	1	2	-	1	1	1	1	-
34	M		CHROMIUM COMPOUNDS	33,644,953	P	A		1	1	1	-	-	2	-	-	-
140	M		COBALT COMPOUNDS	532,351		A		1	1	1	-	-	2	-	-	-
23	M		COPPER COMPOUNDS	53,087,237	P			2	2	2	-	3	1	1	1	-
53	A		CYANIDE COMPOUNDS	10,551,358	P	A		1	1	-	2	2	1	1	1	-
21	O		GLYCOL ETHERS	62,255,269		A	V	-	-	-	-	-	-	-	-	-
31	M		LEAD COMPOUNDS	36,056,604	P	A		1	2	1	-	-	3	1	1	-
15	M		MANGANESE COMPOUNDS	114,926,157		A		1	1	1	1	2	1	-	-	-
213	M		MERCURY COMPOUNDS	21,526	H P	A		2	1	1	-	1	1	1	1	-
55	M		NICKEL COMPOUNDS	10,395,814	P	A		1	1	1	-	2	1	2	1	-
--	M		POLY BROMINATED BIPHENYLS	0			V	-	-	-	-	-	-	-	-	-
180	M		SELENIUM COMPOUNDS	127,331	P	A		1	1	1	1	1	2	1	1	-
196	M		SILVER COMPOUNDS	54,833	P			2	2	2	-	-	1	1	1	-
242	M		THALLIUM COMPOUNDS	2,509	P			1	2	1	-	1	2	2	1	-
9	M		ZINC COMPOUNDS	209,127,626	P			1	1	2	-	2	1	1	1	-
49	X		TOTAL FOR MIXTURES	13,607,176				-	-	-	-	-	-	-	-	-
114	T		TRADE SECRETS	1,306,842				-	-	-	-	-	-	-	-	-
			TOTAL	6,241,030,746												

APPENDIX B: LEGEND FOR CHEMICAL CLASSIFICATION TABLE

RANK

1988=RANK BASED ON TOTAL RELEASES AND TRANSFERS IN 1988
1987=RANK BASED ON TOTAL RELEASES AND TRANSFERS IN 1987
--- =NO TRI REPORTS FOR THE CHEMICAL

CLASS

H=HALO-ORGANICS
O=ORGANIC (NON-HALOGENATED)
A=SIMPLE ACIDS, BASES, AND SALTS
M=METALS AND METAL CONTAINING CHEMICALS
N=NON-METALLIC INORGANIC CHEMICALS
X=MIXTURE/COMPONENT
T=TRADE SECRET

APPLICABLE REGULATIONS AND CATEGORIES

N=NESHAP LISTED AIR POLLUTANT
P=PRIORITY POLLUTANT (TOXIC WATER DISCHARGES)
O=OZONE DEPLETING CHEMICAL
A=LISTED AS AN AIR TOXIC IN PROPOSED CLEAN AIR ACT
V=VOLATILE ORGANIC CHEMICAL

APPENDIX B: LEGEND (con't)

HEALTH AND ENVIRONMENTAL TOXICITY INDICES
(from *Toxic Chemical Release Inventory Risk Screening Guide* EPA 560/2-89-002)

TPQ=THRESHOLD PLANNING QUANTITIES (pounds)
1= 1, 10, 100
2= 500
3= 1,000 - 10,000

RQAH=REPORTABLE QUANTITIES ACUTE (pounds)
1= 1, 10, 100
2= 1,000
3= 5,000

RQCH=REPORTABLE QUANTITIES CHRONIC MAMMAL TOXICITY (pounds)
1= 1, 10, 100
2= 1,000
3= 5,000

RFDI=EPA REFERENCE DOSE INHALATION (mg/kg/day)
1= <0.01
2= 0.01 - 0.10
3= >= 1.0

RFDO=EPA REFERENCE DOSE ORAL (mg/kg/day)
1= <0.01
2= 0.01 - 0.10
3= >1.0

RQAR=REPORTABLE QUANTITY AQUATIC TOXICITY (pounds)
1= 1, 10, 100
2= 1,000
3= 5,000

WQCA=WATER QUALITY CRITERIA ACUTE (mg/l) and
WQCC=WATER QUALITY CRITERIA CHRONIC (mg/l)
1= <1
2= 1 - 10
3= >= 10

CARCINOGENICITY
1=LISTED AS A "DE MINIMIS" CARCINOGEN FOR PURPOSES OF TRI REPORTING (ACCORDING TO OSHA CRITERIA)

APPENDIX C. SIC CODES 20-39

20	Food and Kindred Products
21	Tobacco Products
22	Textile Mill Products
23	Apparel and Other Finished Products made from Fabrics and Other Similar Materials
24	Lumber and Wood Products, Except Furniture
25	Furniture and Fixtures
26	Paper and Allied Products
27	Printing, Publishing, and Allied Industries
28	Chemicals and Allied Products
29	Petroleum Refining and Related Industries
30	Rubber and Miscellaneous Plastics Products
31	Leather and Leather Products
32	Stone, Clay, Glass, and Concrete Products
33	Primary Metal Industries
34	Fabricated Metal Products, Except Machinery and Transportation Equipment
35	Industrial and Commercial Machinery and Computer Equipment
36	Electronic and Other Electrical Equipment and Components, Except Computer Equipment
37	Transportation Equipment
38	Measuring, Analyzing, and Controlling Instruments; Photographic, Medical, and Optical Goods; Watches and Clocks
39	Miscellaneous Manufacturing Industries

Table D-1. AIR EMISSIONS OF CHEMICALS ON THE PROPOSED AIR TOXICS LIST, 1988.

CAS NO.	CHEMICAL	POINT SOURCE		FUGITIVE		TOTAL AIR		TRI TOTAL	
		Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
007647010	HYDROCHLORIC ACID	51,212,395	3.03	5,003,543	0.68	56,215,938	2.32	635,720,989	10.19
000067561	METHANOL	171,468,217	10.14	43,899,334	5.96	215,367,551	8.87	435,639,693	6.98
007664417	AMMONIA	199,616,491	11.80	48,068,399	6.53	247,684,890	10.20	356,101,165	5.71
000108883	TOLUENE	173,833,803	10.28	89,614,660	12.17	263,448,463	10.85	333,315,437	5.34
001330207	XYLENE (MIXED ISOMERS)	109,615,976	6.48	30,648,844	4.16	140,264,820	5.78	181,771,506	2.91
000071556	1,1,1-TRICHLOROETHANE	79,689,328	4.71	81,985,784	11.13	161,675,112	6.66	180,418,488	2.89
000078933	METHYL ETHYL KETONE	91,820,664	5.43	34,300,344	4.66	126,121,008	5.20	156,490,232	2.51
007782505	CHLORINE	129,064,368	7.63	3,502,536	0.48	132,566,904	5.46	147,050,483	2.36
000075092	DICHLOROMETHANE	71,587,386	4.23	43,224,440	5.87	114,811,826	4.73	134,212,442	2.15
--	MANGANESE COMPOUNDS	1,094,211	0.06	525,862	0.07	1,620,073	0.07	114,926,157	1.84
000075150	CARBON DISULFIDE	79,186,318	4.68	3,094,001	0.42	82,280,319	3.39	82,748,299	1.33
--	GLYCOL ETHERS	35,935,313	2.13	9,719,071	1.32	45,654,384	1.88	62,255,269	1.00
000107211	ETHYLENE GLYCOL	9,327,479	0.55	3,901,322	0.53	13,228,801	0.54	55,713,223	0.89
000079016	TRICHLOROETHYLENE	25,561,821	1.51	20,834,198	2.83	46,396,019	1.91	52,616,792	0.84
000100425	STYRENE	22,317,645	1.32	11,298,375	1.53	33,616,020	1.38	42,760,770	0.69
000108101	METHYL ISOBUTYL KETONE	17,873,943	1.06	12,121,805	1.65	29,995,748	1.24	42,704,420	0.68
--	LEAD COMPOUNDS	1,185,474	0.07	404,449	0.05	1,589,923	0.07	36,056,604	0.58
000127184	TETRACHLOROETHYLENE	15,968,309	0.94	15,048,908	2.04	31,017,217	1.28	35,879,858	0.57
--	CHROMIUM COMPOUNDS	431,587	0.03	253,744	0.03	685,331	0.03	33,644,953	0.54
000071432	BENZENE	10,058,775	0.59	18,229,914	2.47	28,288,689	1.17	33,245,252	0.53
000050000	FORMALDEHYDE	8,530,725	0.50	3,801,543	0.52	12,332,268	0.51	30,766,305	0.49
000108952	PHENOL	5,818,364	0.34	4,336,737	0.59	10,155,101	0.42	28,626,202	0.46
000067663	CHLOROFORM	15,839,174	0.94	6,871,200	0.93	22,710,374	0.94	26,604,039	0.43
000075058	ACETONITRILE	864,887	0.05	1,179,145	0.16	2,044,032	0.08	23,585,619	0.38
000079107	ACRYLIC ACID	214,268	0.01	584,299	0.08	798,567	0.03	23,359,031	0.37
001332214	ASBESTOS (FRIABLE)	33,768	0.00	8,532	0.00	42,300	0.00	22,607,676	0.36
007664393	HYDROGEN FLUORIDE	7,942,805	0.47	3,625,185	0.49	11,567,990	0.48	19,917,599	0.32
000463581	CARBONYL SULFIDE	19,117,592	1.13	7,643	0.00	19,125,235	0.79	19,125,985	0.31
000108054	VINYL ACETATE	4,228,850	0.25	1,360,906	0.18	5,589,756	0.23	11,552,902	0.19
000107131	ACRYLONITRILE	3,200,082	0.19	1,022,364	0.14	4,222,446	0.17	10,841,495	0.17
--	CYANIDE COMPOUNDS	108,663	0.01	523,263	0.07	631,926	0.03	10,551,358	0.17
000100414	ETHYLBENZENE	3,819,831	0.23	2,674,266	0.36	6,494,097	0.27	10,409,714	0.17
--	NICKEL COMPOUNDS	102,837	0.01	143,148	0.02	245,985	0.01	10,395,814	0.17
000075070	ACETALDEHYDE	4,132,695	0.24	2,540,419	0.34	6,673,114	0.27	10,009,783	0.16
000108907	CHLOROBENZENE	2,023,160	0.12	1,907,710	0.26	3,930,870	0.16	9,739,652	0.16
000074873	CHLOROMETHANE	6,778,071	0.40	2,060,596	0.28	8,838,667	0.36	9,322,871	0.15
001336363	POLYCHLORINATED BIPHENYLS (PCBs)	0	0.00	0	0.00	0	0.00	9,286,906	0.15
000106423	P-XYLENE	4,107,772	0.24	2,198,210	0.30	6,305,982	0.26	7,683,788	0.12
000107062	1,2-DICHLOROETHANE	2,569,727	0.15	1,443,130	0.20	4,012,857	0.17	7,567,049	0.12
000085449	PHTHALIC ANHYDRIDE	420,923	0.02	126,456	0.02	547,379	0.02	7,275,031	0.12
000106990	1,3-BUTADIENE	2,626,680	0.16	3,771,933	0.51	6,398,613	0.26	7,212,227	0.12
000062533	ANILINE	387,926	0.02	326,450	0.04	714,376	0.03	7,154,770	0.11
000080626	METHYL METHACRYLATE	2,267,221	0.13	1,122,345	0.15	3,389,566	0.14	7,043,579	0.11
--	ARSENIC COMPOUNDS	160,941	0.01	41,111	0.01	202,052	0.01	7,020,945	0.11
000091203	NAPHTHALENE	1,528,253	0.09	2,236,248	0.30	3,764,501	0.16	6,662,672	0.11
000056235	CARBON TETRACHLORIDE	2,705,385	0.16	1,058,745	0.14	3,764,130	0.16	5,085,155	0.08
000075218	ETHYLENE OXIDE	3,841,202	0.23	750,826	0.10	4,592,028	0.19	5,053,707	0.08
000075003	CHLOROETHANE	2,331,288	0.14	2,054,623	0.28	4,385,911	0.18	4,849,583	0.08
000098828	CUMENE	2,773,195	0.16	1,494,569	0.20	4,267,764	0.18	4,717,001	0.08
000075569	PROPYLENE OXIDE	2,413,746	0.14	550,924	0.07	2,964,670	0.12	4,625,911	0.07
--	ANTIMONY COMPOUNDS	213,654	0.01	76,842	0.01	290,496	0.01	4,603,260	0.07
000111422	DIETHANOLAMINE	113,383	0.01	419,973	0.06	533,356	0.02	4,478,996	0.07
001319773	CRESOL (MIXED ISOMERS)	373,290	0.02	292,820	0.04	666,110	0.03	4,176,089	0.07
007723140	PHOSPHORUS (YELLOW OR WHITE)	11,783	0.00	7,314	0.00	19,097	0.00	3,970,179	0.06
000108383	M-XYLENE	953,937	0.06	1,057,221	0.14	2,011,158	0.08	3,560,624	0.06
000087865	PENTACHLOROPHENOL	5,646	0.00	8,133	0.00	13,779	0.00	3,549,662	0.06
000087683	HEXACHLORO-1,3-BUTADIENE	513	0.00	2,043	0.00	2,556	0.00	3,535,870	0.06
000117817	DI-(2-ETHYLHEXYL) PHTHALATE	941,708	0.06	147,728	0.02	1,089,436	0.04	3,506,080	0.06
000120821	1,2,4-TRICHLOROBENZENE	1,073,639	0.06	436,067	0.06	1,509,706	0.06	2,962,563	0.05
000095476	O-XYLENE	684,646	0.04	1,274,560	0.17	1,959,206	0.08	2,928,235	0.05
001634044	METHYL TERT-BUTYL ETHER	2,011,081	0.12	758,380	0.10	2,769,461	0.11	2,904,960	0.05

Table D-1. AIR EMISSIONS OF CHEMICALS ON THE PROPOSED AIR TOXICS LIST, 1988, cont.

CAS NO.	CHEMICAL	POINT SOURCE Pounds	POINT SOURCE Percent	FUGITIVE Pounds	FUGITIVE Percent	TOTAL AIR Pounds	TOTAL AIR Percent	TRI TOTAL Pounds	TRI TOTAL Percent
000108316	MALEIC ANHYDRIDE	660,623	0.04	103,297	0.01	763,920	0.03	2,551,667	0.04
000098953	NITROBENZENE	16,680	0.00	22,614	0.00	39,294	0.00	2,243,116	0.04
000101688	METHYLENEBIS(PHENYLISOCYANATE)	93,692	0.01	191,489	0.03	285,181	0.01	2,196,828	0.04
000075014	VINYL CHLORIDE	995,356	0.06	392,474	0.05	1,387,830	0.06	2,072,382	0.03
000106467	1,4-DICHLOROBENZENE	1,745,449	0.10	62,852	0.01	1,808,301	0.07	2,007,383	0.03
000079005	1,1,2-TRICHLOROETHANE	1,122,814	0.07	617,288	0.08	1,740,102	0.07	2,003,286	0.03
000120809	CATECHOL	1,201	0.00	2,388	0.00	3,589	0.00	1,838,183	0.03
007550450	TITANIUM TETRACHLORIDE	40,054	0.00	38,614	0.01	78,668	0.00	1,745,713	0.03
000106445	P-CRESOL	634,417	0.04	6,286	0.00	640,703	0.03	1,627,975	0.03
--	CADMIUM COMPOUNDS	76,659	0.00	21,577	0.00	98,236	0.00	1,571,920	0.03
000078875	1,2-DICHLOROPROPANE	1,071,246	0.06	292,898	0.04	1,364,144	0.06	1,536,395	0.02
000126998	CHLOROPRENE	983,698	0.06	233,923	0.03	1,217,621	0.05	1,363,891	0.02
000123319	HYDROQUINONE	6,733	0.00	3,547	0.00	10,280	0.00	1,213,422	0.02
000074839	BROMOMETHANE	762,718	0.05	428,853	0.06	1,191,571	0.05	1,193,117	0.02
000123911	1,4-DIOXANE	240,445	0.01	293,308	0.04	533,753	0.02	1,092,862	0.02
000121142	2,4-DINITROTOLUENE	77,724	0.00	14,489	0.00	92,213	0.00	1,051,965	0.02
000123386	PROPIONALDEHYDE	829,582	0.05	216,628	0.03	1,046,210	0.04	1,050,657	0.02
000079061	ACRYLAMIDE	8,721	0.00	17,298	0.00	26,019	0.00	1,032,887	0.02
000118741	HEXACHLOROBENZENE	497	0.00	4,497	0.00	4,994	0.00	970,287	0.02
000101779	4,4'-METHYENEDIANILINE	107,750	0.01	42,479	0.01	150,229	0.01	902,504	0.01
000051285	2,4-DINITROPHENOL	8,439	0.00	12,386	0.00	20,825	0.00	884,624	0.01
000084742	DIBUTYL PHTHALATE	27,219	0.00	188,224	0.03	215,443	0.01	883,490	0.01
000121697	N,N-DIMETHYLANILINE	80,457	0.00	18,448	0.00	98,905	0.00	872,774	0.01
000131113	DIMETHYL PHTHALATE	172,732	0.01	48,319	0.01	221,051	0.01	855,192	0.01
000075354	VINYLIDENE CHLORIDE	191,801	0.01	107,552	0.01	299,353	0.01	711,956	0.01
000079469	2-NITROPROPANE	173,414	0.01	213,455	0.03	386,869	0.02	664,864	0.01
000077474	HEXACHLOROCYCLOPENTADIENE	415	0.00	14,303	0.00	14,718	0.00	637,022	0.01
000106898	EPICHLOROHYDRIN	173,303	0.01	230,208	0.03	403,511	0.02	582,393	0.01
000100027	4-NITROPHENOL	213	0.00	7,642	0.00	7,855	0.00	574,660	0.01
--	COBALT COMPOUNDS	46,394	0.00	10,826	0.00	57,220	0.00	532,351	0.01
000067721	HEXACHLOROETHANE	13,048	0.00	2,699	0.00	15,747	0.00	530,356	0.01
000584849	TOLUENE-2,4-DIISOCYANATE	181,528	0.01	45,144	0.01	226,672	0.01	430,232	0.01
000140885	ETHYL ACRYLATE	118,602	0.01	132,230	0.02	250,832	0.01	388,335	0.01
000132649	DIBENZOFURAN	24,609	0.00	49,839	0.01	74,448	0.00	367,647	0.01
000106887	1,2-BUTYLENE OXIDE	62,350	0.00	29,346	0.00	91,696	0.00	353,587	0.01
000107051	ALLYL CHLORIDE	56,358	0.00	90,111	0.01	146,469	0.01	312,842	0.01
000534521	4,6-DINITRO-O-CRESOL	15	0.00	259	0.00	274	0.00	306,657	0.00
000072435	METHOXYCHLOR	224,910	0.01	47,971	0.01	272,881	0.01	298,150	0.00
001120714	PROPANE SULTONE	0	0.00	263,000	0.04	263,000	0.01	263,000	0.00
000106503	P-PHENYLENEDIAMINE	111,680	0.01	2,210	0.00	113,890	0.00	243,632	0.00
000091941	3,3'-DICHLOROBENZIDINE	5	0.00	250	0.00	255	0.00	225,829	0.00
000095487	O-CRESOL	44,223	0.00	44,829	0.01	89,052	0.00	222,144	0.00
000079345	1,1,2,2-TETRACHLOROETHANE	17,951	0.00	27,780	0.00	45,731	0.00	199,592	0.00
001582098	TRIFLURALIN	1,257	0.00	1,770	0.00	3,027	0.00	194,545	0.00
000108394	M-CRESOL	12,322	0.00	5,610	0.00	17,932	0.00	164,825	0.00
000051796	URETHANE	4,123	0.00	140,000	0.02	144,123	0.01	145,733	0.00
000094757	2,4-D (ACETIC ACID)	3,731	0.00	3,289	0.00	7,020	0.00	143,067	0.00
--	SELENIUM COMPOUNDS	12,005	0.00	1,500	0.00	13,505	0.00	127,331	0.00
000107028	ACROLEIN	16,300	0.00	17,318	0.00	33,618	0.00	103,568	0.00
000095534	O-TOLUIDINE	27,726	0.00	19,196	0.00	46,922	0.00	101,440	0.00
000076448	HEPTACHLOR	3	0.00	49,052	0.01	49,055	0.00	101,029	0.00
000106934	1,2-DIBROMOETHANE	24,063	0.00	30,664	0.00	54,727	0.00	96,993	0.00
000057749	CHLORDANE	3	0.00	572	0.00	575	0.00	85,673	0.00
000156627	CALCIUM CYANAMIDE	600	0.00	12,000	0.00	12,600	0.00	78,600	0.00
000302012	HYDRAZINE	7,488	0.00	20,301	0.00	27,789	0.00	74,808	0.00
000091225	QUINOLINE	17,717	0.00	31,633	0.00	49,350	0.00	68,341	0.00
000542756	1,3-DICHLOROPROPYLENE	12,810	0.00	39,490	0.01	52,300	0.00	60,488	0.00
000133062	CAPTAN	11,553	0.00	4,316	0.00	15,869	0.00	46,264	0.00
000079118	CHLOROACETIC ACID	4,659	0.00	21,160	0.00	25,819	0.00	46,062	0.00
000111444	BIS(2-CHLOROETHYL) ETHER	600	0.00	4,322	0.00	4,922	0.00	43,159	0.00
000063252	CARBARYL	5,408	0.00	2,265	0.00	7,673	0.00	42,501	0.00
000075445	PHOSGENE	17,764	0.00	3,829	0.00	21,593	0.00	23,857	0.00
--	MERCURY COMPOUNDS	1,365	0.00	1,001	0.00	2,366	0.00	21,526	0.00
--	BERYLLIUM COMPOUNDS	861	0.00	1	0.00	862	0.00	21,423	0.00
000624839	METHYL ISOCYANATE	586	0.00	9,589	0.00	10,175	0.00	18,703	0.00
000056382	PARATHION	1,007	0.00	2,258	0.00	3,265	0.00	17,386	0.00
000082688	QUINTOZENE	314	0.00	750	0.00	1,064	0.00	13,939	0.00
000057147	1,1-DIMETHYL HYDRAZINE	2,117	0.00	2,206	0.00	4,323	0.00	13,188	0.00
000077781	DIMETHYL SULFATE	1,625	0.00	9,171	0.00	10,796	0.00	12,456	0.00
000088062	2,4,6-TRICHLOROPHENOL	250	0.00	0	0.00	250	0.00	12,310	0.00

Table D-1. AIR EMISSIONS OF CHEMICALS ON THE PROPOSED AIR TOXICS LIST, 1988, cont.

CAS NO.	CHEMICAL	POINT SOURCE Pounds	POINT SOURCE Percent	FUGITIVE Pounds	FUGITIVE Percent	TOTAL AIR Pounds	TOTAL AIR Percent	TRI TOTAL Pounds	TRI TOTAL Percent
000106514	QUINONE	6,700	0.00	4,600	0.00	11,300	0.00	11,720	0.00
000074884	METHYL IODIDE	3,253	0.00	5,691	0.00	8,944	0.00	9,449	0.00
000075252	BROMOFORM	0	0.00	0	0.00	0	0.00	8,600	0.00
000101144	4,4'-METHYLENEBIS(2-CHLORO ANILIN	250	0.00	500	0.00	750	0.00	7,000	0.00
000064675	DIETHYL SULFATE	1,648	0.00	4,177	0.00	5,825	0.00	6,965	0.00
000060344	METHYL HYDRAZINE	153	0.00	2,774	0.00	2,927	0.00	5,628	0.00
000593602	VINYL BROMIDE	950	0.00	4,000	0.00	4,950	0.00	5,350	0.00
000095807	2,4-DIAMINOTOLUENE	88	0.00	2,900	0.00	2,988	0.00	4,438	0.00
000090040	O-ANISIDINE	1,792	0.00	501	0.00	2,293	0.00	3,599	0.00
000096457	ETHYLENE THIOUREA	500	0.00	0	0.00	500	0.00	3,500	0.00
000096093	STYRENE OXIDE	1,803	0.00	511	0.00	2,314	0.00	3,314	0.00
000133904	CHLORAMBEN	1,168	0.00	250	0.00	1,418	0.00	2,827	0.00
000062737	DICHLORVOS	0	0.00	1,010	0.00	1,010	0.00	2,526	0.00
000075558	PROPYLENEIMINE	250	0.00	250	0.00	500	0.00	750	0.00
000114261	PROPOXUR	0	0.00	250	0.00	250	0.00	500	0.00
000151564	ETHYLENEIMINE	250	0.00	250	0.00	500	0.00	500	0.00
000058899	LINDANE	7	0.00	251	0.00	258	0.00	444	0.00
000060355	ACETAMIDE	0	0.00	0	0.00	0	0.00	250	0.00
000107302	CHLOROMETHYL METHYL ETHER	90	0.00	32	0.00	122	0.00	122	0.00
000095954	2,4,5-TRICHLOROPHENOL	90	0.00	0	0.00	90	0.00	110	0.00
000092671	4-AMINOBIPHENYL	10	0.00	0	0.00	10	0.00	14	0.00
000542881	BIS(CHLOROMETHYL) ETHER	0	0.00	1	0.00	1	0.00	1	0.00
000079447	DIMETHYLCARBAMYL CHLORIDE	0	0.00	0	0.00	0	0.00	0	0.00
000334883	DIAZOMETHANE	0	0.00	0	0.00	0	0.00	0	0.00
000062759	N-NITROSODIMETHYLAMINE	0	0.00	0	0.00	0	0.00	0	0.00
000092933	4-NITROBIPHENYL	0	0.00	0	0.00	0	0.00	0	0.00
000059892	N-NITROSOMORPHOLINE	0	0.00	0	0.00	0	0.00	0	0.00
000119904	3,3'-DIMETHOXYBENZIDINE	0	0.00	0	0.00	0	0.00	0	0.00
000092875	BENZIDINE	0	0.00	0	0.00	0	0.00	0	0.00
000060117	4-DIMETHYLAMINOAZOBENZENE	0	0.00	0	0.00	0	0.00	0	0.00
000510156	CHLOROBENZILATE	0	0.00	0	0.00	0	0.00	0	0.00
000680319	HEXAMETHYLPHOSPHORAMIDE	0	0.00	0	0.00	0	0.00	0	0.00
000684935	N-NITROSO-N-METHYLUREA	0	0.00	0	0.00	0	0.00	0	0.00
000057578	BETA-PROPIOLACTONE	0	0.00	0	0.00	0	0.00	0	0.00
000119937	3,3'-DIMETHYLBENZIDINE	0	0.00	0	0.00	0	0.00	0	0.00
000122667	1,2-DIPHENYLHYDRAZINE	0	0.00	0	0.00	0	0.00	0	0.00
000532274	2-CHLOROACETOPHENONE	0	0.00	0	0.00	0	0.00	0	0.00
000053963	2-ACETYLAMINOFLUORENE	0	0.00	0	0.00	0	0.00	0	0.00
000096128	1,2-DIBROMO-3-CHLOROPROPANE	0	0.00	0	0.00	0	0.00	0	0.00
008001352	TOXAPHENE	0	0.00	0	0.00	0	0.00	0	0.00
	SUBTOTAL	1,425,535,798	84.30	535,038,181	72.64	1,960,573,979	80.76	3,606,667,508	57.79
	TOTAL FOR ALL OTHERS	265,440,255	15.70	201,555,869	27.36	466,996,124	19.24	2,634,363,238	42.21
	GRAND TOTAL	1,690,976,053	100.00	736,594,050	100.00	2,427,570,103	100.00	6,241,030,746	100.00

Table D-2. TRI Discharges to Surface Water of Priority Pollutants, 1988.

CAS NO.	CHEMICAL	SURFACE WATER		TRI TOTAL	
		Pounds	Percent	Pounds	Percent
000051285	2,4-DINITROPHENOL	98,692	0.03	884,624	0.01
000056235	CARBON TETRACHLORIDE	15,917	0.00	5,085,155	0.08
000057749	CHLORDANE	4	0.00	85,673	0.00
000058899	LINDANE	0	0.00	444	0.00
000062759	N-NITROSODIMETHYLAMINE	0	0.00	0	0.00
000067561	METHANOL	16,627,648	4.60	435,639,693	6.98
000067663	CHLOROFORM	1,094,443	0.30	26,604,039	0.43
000067721	HEXACHLOROETHANE	11	0.00	530,356	0.01
000071432	BENZENE	47,589	0.01	33,245,252	0.53
000071556	1,1,1-TRICHLOROETHANE	121,871	0.03	180,418,488	2.89
000074839	BROMOMETHANE	0	0.00	1,193,117	0.02
000074873	CHLOROMETHANE	112,049	0.03	9,322,871	0.15
000075003	CHLOROETHANE	1,613	0.00	4,849,583	0.08
000075014	VINYL CHLORIDE	2,028	0.00	2,072,382	0.03
000075092	DICHLOROMETHANE	267,282	0.07	134,212,442	2.15
000075252	BROMOFORM	8,600	0.00	8,600	0.00
000075274	DICHLOROBROMOMETHANE	0	0.00	0	0.00
000075354	VINYLIDENE CHLORIDE	3,462	0.00	711,956	0.01
000076448	HEPTACHLOR	2	0.00	101,029	0.00
000077474	HEXACHLOROCYCLOPENTADIENE	6	0.00	637,022	0.01
000078875	1,2-DICHLOROPROPANE	23,985	0.01	1,536,395	0.02
000079016	TRICHLOROETHYLENE	13,550	0.00	52,616,792	0.84
000079345	1,1,2,2-TETRACHLOROETHANE	814	0.00	199,592	0.00
000084662	DIETHYL PHTHALATE	11,272	0.00	241,102	0.00
000084742	DIBUTYL PHTHALATE	14,059	0.00	883,490	0.01
000085687	BUTYL BENZYL PHTHALATE	802	0.00	1,380,584	0.02
000086306	N-NITROSODIPHENYLAMINE	27	0.00	34,327	0.00
000087683	HEXACHLORO-1,3-BUTADIENE	153	0.00	3,535,870	0.06
000087865	PENTACHLOROPHENOL	2,465	0.00	3,549,662	0.06
000088062	2,4,6-TRICHLOROPHENOL	50	0.00	12,310	0.00
000088755	2-NITROPHENOL	1	0.00	197,392	0.00
000091203	NAPHTHALENE	90,404	0.03	6,662,672	0.11
000092875	BENZIDINE	0	0.00	0	0.00
000095501	1,2-DICHLOROBENZENE	11,874	0.00	2,470,161	0.04
000098953	NITROBENZENE	6,657	0.00	2,243,116	0.04
000100027	4-NITROPHENOL	0	0.00	574,660	0.01
000100414	ETHYLBENZENE	16,339	0.00	10,409,714	0.17
000105679	2,4-DIMETHYLPHENOL	481	0.00	38,606	0.00
000106467	1,4-DICHLOROBENZENE	6,153	0.00	2,007,383	0.03
000107028	ACROLEIN	0	0.00	103,568	0.00
000107062	1,2-DICHLOROETHANE	39,017	0.01	7,567,049	0.12
000107131	ACRYLONITRILE	5,874	0.00	10,841,495	0.17
000108601	BIS(2-CHLORO-1-METHYLETHYL)ETHER	30,000	0.01	31,140	0.00
000108883	TOLUENE	260,159	0.07	333,315,437	5.34
000108907	CHLOROBENZENE	98,354	0.03	9,739,652	0.16
000108952	PHENOL	262,127	0.07	28,626,202	0.46
000111444	BIS(2-CHLOROETHYL) ETHER	1,351	0.00	43,159	0.00
000117817	DI-(2-ETHYLHEXYL) PHTHALATE	3,023	0.00	3,506,080	0.06
000117840	N-DIOCTYL PHTHALATE	1,493	0.00	296,468	0.00
000118741	HEXACHLOROBENZENE	4	0.00	970,287	0.02
000120127	ANTHRACENE	4,382	0.00	437,542	0.01
000120821	1,2,4-TRICHLOROBENZENE	31,563	0.01	2,962,563	0.05
000120832	2,4-DICHLOROPHENOL	107	0.00	32,127	0.00
000121142	2,4-DINITROTOLUENE	12,055	0.00	1,051,965	0.02
000122667	1,2-DIPHENYLHYDRAZINE	0	0.00	0	0.00
000127184	TETRACHLOROETHYLENE	35,984	0.01	35,879,858	0.57
000131113	DIMETHYL PHTHALATE	4,335	0.00	855,192	0.01

Table D-2. TRI Discharges to Surface Water of Priority Pollutants, 1988, continued.

CAS NO.	CHEMICAL	SURFACE WATER Pounds	SURFACE WATER Percent	TRI TOTAL Pounds	TRI TOTAL Percent
000309002	ALDRIN	0	0.00	0	0.00
000534521	4,6-DINITRO-O-CRESOL	266	0.00	306,657	0.00
000540590	1,2-DICHLOROETHYLENE	95	0.00	318,200	0.01
000541731	1,3-DICHLOROBENZENE	1,281	0.00	75,949	0.00
000606202	2,6-DINITROTOLUENE	957	0.00	316,878	0.01
000621647	N-NITROSODI-N-PROPYLAMINE	0	0.00	0	0.00
001332214	ASBESTOS (FRIABLE)	10,449	0.00	22,607,674	0.36
001336363	POLYCHLORINATED BIPHENYLS (PCBs)	10	0.00	9,286,906	0.15
007439921	LEAD	118,279	0.03	22,434,784	0.36
007439976	MERCURY	1,397	0.00	296,679	0.00
007440020	NICKEL	86,095	0.02	8,999,971	0.14
007440224	SILVER	1,404	0.00	119,057	0.00
007440280	THALLIUM	0	0.00	0	0.00
007440360	ANTIMONY	22,765	0.01	2,305,775	0.04
007440382	ARSENIC	1,282	0.00	238,229	0.00
007440417	BERYLLIUM	324	0.00	44,249	0.00
007440439	CADMIUM	2,348	0.00	451,065	0.01
007440473	CHROMIUM	83,234	0.02	21,296,563	0.34
007440508	COPPER	113,931	0.03	34,566,659	0.55
007440666	ZINC (FUME OR DUST)	429,448	0.12	66,013,165	1.06
007782492	SELENIUM	1,168	0.00	152,160	0.00
008001352	TOXAPHENE	0	0.00	0	0.00
--	ANTIMONY COMPOUNDS	31,394	0.01	4,603,260	0.07
--	ARSENIC COMPOUNDS	6,492	0.00	7,020,945	0.11
--	BERYLLIUM COMPOUNDS	17	0.00	21,423	0.00
--	CADMIUM COMPOUNDS	1,765	0.00	1,571,920	0.03
--	CHLOROPHENOLS	272	0.00	2,047,961	0.03
--	CHROMIUM COMPOUNDS	326,224	0.09	33,644,953	0.54
--	COPPER COMPOUNDS	177,808	0.05	53,087,237	0.85
--	CYANIDE COMPOUNDS	190,906	0.05	10,551,358	0.17
--	LEAD COMPOUNDS	179,882	0.05	36,056,604	0.58
--	MERCURY COMPOUNDS	259	0.00	21,526	0.00
--	NICKEL COMPOUNDS	125,062	0.03	10,395,814	0.17
--	SELENIUM COMPOUNDS	250	0.00	127,331	0.00
--	SILVER COMPOUNDS	8,934	0.00	54,833	0.00
--	THALLIUM COMPOUNDS	750	0.00	2,509	0.00
--	ZINC COMPOUNDS	1,035,284	0.29	209,127,626	3.35
	SUBTOTAL	**22,350,163**	**6.18**	**1,918,622,238**	**30.74**
	TOTAL FOR ALL OTHERS	**339,244,075**	**93.82**	**4,322,408,508**	**69.26**
	GRAND TOTAL	**361,594,238**	**100.00**	**6,241,030,746**	**100.00**

Table D-3. TRI Point Source and Fugitive Air Emissions by State, 1988.

STATE	POINT SOURCE AIR			FUGITIVE AIR			TOTAL AIR		
	Pounds	Percent	Rank	Pounds	Percent	Rank	Pounds	Percent	Rank
Alabama	39,617,975	73.06	18	14,606,705	26.94	17	54,224,680	100.00	16
Alaska	21,652,228	98.44	27	343,987	1.56	52	21,996,215	100.00	32
American Samoa	0	0.00	54	29,500	100.00	53	29,500	100.00	53
Arizona	8,167,121	55.26	38	6,612,954	44.74	32	14,780,075	100.00	38
Arkansas	36,019,601	76.96	20	10,782,273	23.04	23	46,801,874	100.00	21
California	48,131,988	58.99	13	33,462,270	41.01	8	81,594,258	100.00	13
Colorado	5,986,609	53.79	40	5,142,587	46.21	35	11,129,196	100.00	40
Connecticut	11,427,974	47.72	36	12,522,362	52.28	22	23,950,336	100.00	31
Delaware	4,102,421	84.18	41	771,017	15.82	44	4,873,438	100.00	42
District of Columbia	0	0.00	53	250	100.00	54	250	100.00	54
Florida	30,924,535	58.23	23	22,182,936	41.77	12	53,107,471	100.00	18
Georgia	67,200,760	81.42	9	15,338,099	18.58	15	82,538,859	100.00	12
Hawaii	338,840	38.76	51	535,305	61.24	48	874,145	100.00	51
Idaho	2,824,178	70.91	43	1,158,400	29.09	42	3,982,578	100.00	43
Illinois	61,791,387	59.08	11	42,801,320	40.92	3	104,592,707	100.00	8
Indiana	68,349,221	62.09	8	41,726,406	37.91	4	110,075,627	100.00	7
Iowa	33,285,420	77.17	21	9,849,695	22.83	25	43,135,115	100.00	24
Kansas	17,073,844	69.32	30	7,557,808	30.68	31	24,631,652	100.00	30
Kentucky	28,990,676	66.28	24	14,748,979	33.72	16	43,739,655	100.00	23
Louisiana	108,544,156	81.57	2	24,526,356	18.43	11	133,070,512	100.00	4
Maine	13,525,045	81.70	33	3,028,837	18.30	38	16,553,882	100.00	36
Maryland	12,406,545	71.37	34	4,977,381	28.63	36	17,383,926	100.00	35
Massachusetts	16,815,874	63.47	31	9,678,166	36.53	27	26,494,040	100.00	29
Michigan	69,527,835	72.70	7	26,113,232	27.30	10	95,641,067	100.00	9
Minnesota	41,172,434	83.37	16	8,215,590	16.63	30	49,388,024	100.00	19
Mississippi	40,453,165	74.96	17	13,515,752	25.04	20	53,968,917	100.00	17
Missouri	38,378,051	78.91	19	10,256,057	21.09	24	48,634,108	100.00	20
Montana	586,999	24.62	50	1,797,168	75.38	41	2,384,167	100.00	46
Nebraska	12,304,359	70.31	35	5,194,718	29.69	34	17,499,077	100.00	34
Nevada	336,492	46.44	52	388,128	53.56	50	724,620	100.00	52
New Hampshire	8,473,670	72.70	37	3,181,260	27.30	37	11,654,930	100.00	39
New Jersey	22,909,519	62.73	25	13,613,220	37.27	19	36,522,739	100.00	25
New Mexico	1,186,431	63.00	46	696,862	37.00	46	1,883,293	100.00	47
New York	57,205,584	61.64	12	35,600,885	38.36	6	92,806,469	100.00	10
North Carolina	62,042,982	70.24	10	26,292,127	29.76	9	88,335,109	100.00	11
North Dakota	863,864	69.88	48	372,396	30.12	51	1,236,260	100.00	50
Ohio	95,612,900	70.07	4	40,841,029	29.93	5	136,453,929	100.00	2
Oklahoma	22,452,953	72.19	26	8,647,896	27.81	29	31,100,849	100.00	27
Oregon	13,831,962	69.55	32	6,055,136	30.45	33	19,887,098	100.00	33
Pennsylvania	46,724,069	57.69	14	34,263,572	42.31	7	80,987,641	100.00	14
Puerto Rico	6,129,458	39.39	39	9,432,826	60.61	28	15,562,284	100.00	37
Rhode Island	2,979,882	51.61	42	2,794,142	48.39	39	5,774,024	100.00	41
South Carolina	44,907,839	71.72	15	17,705,288	28.28	14	62,613,127	100.00	15
South Dakota	1,819,027	73.38	45	659,933	26.62	47	2,478,960	100.00	45
Tennessee	82,922,835	62.02	6	50,774,623	37.98	2	133,697,458	100.00	3
Texas	95,526,506	56.21	5	74,410.253	43.79	1	169,936,759	100.00	1
Utah	116,623,289	97.67	1	2,786,976	2.33	40	119,410,265	100.00	6
Vermont	1,104,318	72.69	47	414,975	27.31	49	1,519,293	100.00	48
Virgin Islands	742,462	49.80	49	748.330	50.20	45	1,490,792	100.00	49
Virginia	97,697,939	81.69	3	21,895,818	18.31	13	119,593,757	100.00	5
Washington	17,788,268	64.44	29	9,815,880	35.56	26	27,604,148	100.00	28
West Virginia	17,918,984	56.20	28	13,966,202	43.80	18	31,885,186	100.00	26
Wisconsin	31,718,822	71.42	22	12,693,814	28.58	21	44,412,636	100.00	22
Wyoming	1,856,757	63.52	44	1,066,369	36.48	43	2,923,126	100.00	44
TOTAL	1,690,976,053	69.66		736,594,050	30.34		2,427,570,103	100.00	

Table D-4. TYPES OF TRI LAND DISPOSAL BY STATE, 1988.

STATE	LANDFILL		LAND TREATMENT		SURFACE IMPOUNDMENT		OTHER LAND		UNKNOWN LAND		TOTAL LAND DISPOSAL	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
Alabama	2,829,700	61.55	918,988	19.99	809,670	17.61	39,215	0.85	0	0.00	4,597,573	100.00
Alaska	0	0.00	0	0.00	0	0.00	1,467	100.00	0	0.00	1,467	100.00
American Samoa	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	100.00
Arizona	12,670	0.02	250	0.00	6,500,571	12.09	47,250,914	87.89	0	0.00	53,764,405	100.00
Arkansas	225,079	11.61	42,262	2.18	1,653,615	85.31	17,444	0.90	0	0.00	1,938,400	100.00
California	11,109,336	61.16	93,512	0.51	5,649,282	31.10	1,311,360	7.22	0	0.00	18,163,490	100.00
Colorado	2,435,662	92.90	500	0.02	141,223	5.39	44,320	1.69	0	0.00	2,621,705	100.00
Connecticut	1,276,228	76.13	1	0.00	390,210	23.28	10,029	0.60	0	0.00	1,676,468	100.00
Delaware	0	0.00	139,231	55.42	111,400	44.35	577	0.23	0	0.00	251,208	100.00
Dist. of Col.	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	100.00
Florida	25,765,577	31.21	450,811	0.55	4,008,105	4.86	52,327,843	63.39	250	0.00	82,552,586	100.00
Georgia	8,637,394	94.11	16,139	0.18	394,187	4.29	24,852	0.27	105,640	1.15	9,178,212	100.00
Hawaii	100,695	56.02	71,750	39.92	0	0.00	2,500	1.39	4,800	2.67	179,745	100.00
Idaho	80,000	0.79	1,030,125	10.13	5,119,691	50.32	3,943,490	38.76	0	0.00	10,173,306	100.00
Illinois	8,149,001	77.84	719,045	6.87	119,883	1.15	1,481,261	14.15	0	0.00	10,469,190	100.00
Indiana	58,729,805	93.16	2,976,831	4.72	171,035	0.27	1,165,714	1.85	0	0.00	63,043,385	100.00
Iowa	195,834	81.59	3,800	1.58	9,557	3.98	30,839	12.85	0	0.00	240,030	100.00
Kansas	67,812	14.06	11,712	2.43	393,600	81.60	9,200	1.91	0	0.00	482,324	100.00
Kentucky	5,395,210	94.05	12,212	0.21	167,853	2.93	161,082	2.81	0	0.00	5,736,357	100.00
Louisiana	1,470,070	72.78	125,173	6.20	295,883	14.65	128,677	6.37	0	0.00	2,019,803	100.00
Maine	946,212	99.01	250	0.03	0	0.00	9,171	0.96	0	0.00	955,633	100.00
Maryland	2,563,166	96.13	15,150	0.57	4,204	0.16	2,292	0.09	81,464	3.06	2,666,276	100.00
Massachusetts	41,188	4.54	0	0.00	0	0.00	865,469	95.46	0	0.00	906,657	100.00
Michigan	5,765,298	32.77	1,509,264	8.58	10,127,371	57.56	192,051	1.09	0	0.00	17,593,984	100.00
Minnesota	844,905	94.99	37,510	4.22	33	0.00	7,000	0.79	0	0.00	889,448	100.00
Mississippi	2,211,395	24.57	38,889	0.43	6,686,000	74.28	64,211	0.71	0	0.00	9,000,495	100.00
Missouri	313,787	0.78	624	0.00	34,793	0.09	39,832,855	99.13	0	0.00	40,182,059	100.00
Montana	144,000	0.44	350	0.00	128,957	0.39	32,637,300	99.17	0	0.00	32,910,607	100.00
Nebraska	1,000	1.82	0	0.00	4,487	8.16	49,531	90.03	0	0.00	55,018	100.00
Nevada	3,393,100	97.21	0	0.00	81,102	2.32	16,319	0.47	0	0.00	3,490,521	100.00
New Hampshire	428,558	99.93	0	0.00	0	0.00	310	0.07	0	0.00	428,868	100.00
New Jersey	750,311	26.10	1,671	0.06	477,227	16.60	1,645,366	57.24	0	0.00	2,874,575	100.00
New Mexico	250	0.00	8,371	0.04	899,961	4.04	21,359,300	95.92	0	0.00	22,267,882	100.00
New York	737,572	64.64	33,842	2.97	123,150	10.79	238,538	20.90	8,000	0.70	1,141,102	100.00
North Carolina	8,554,570	43.63	792,362	4.04	9,999,508	51.00	261,228	1.33	0	0.00	19,607,668	100.00
North Dakota	502	66.76	250	33.24	0	0.00	0	0.00	0	0.00	752	100.00
Ohio	29,189,739	96.65	127,542	0.42	589,042	1.95	295,924	0.98	0	0.00	30,202,247	100.00
Oklahoma	1,042,346	58.30	28,528	1.60	611,190	34.18	105,845	5.92	0	0.00	1,787,909	100.00
Oregon	209,289	20.28	244,714	23.71	567,760	55.01	10,269	1.00	0	0.00	1,032,032	100.00
Pennsylvania	6,034,074	36.74	36,870	0.22	9,627,781	58.62	723,214	4.40	2,700	0.02	16,424,639	100.00
Puerto Rico	100,825	91.81	0	0.00	6,000	5.46	3,000	2.73	0	0.00	109,825	100.00
Rhode Island	0	0.00	32,696	20.70	68,500	43.36	56,772	35.94	0	0.00	157,968	100.00
South Carolina	761,218	58.27	84,959	6.50	412,139	31.55	47,947	3.67	0	0.00	1,306,263	100.00
South Dakota	1	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00
Tennessee	7,976,161	60.38	3,937	0.03	4,918,350	37.23	311,609	2.36	0	0.00	13,210,057	100.00
Texas	16,094,100	52.19	759,965	2.46	1,654,465	5.37	12,326,117	39.97	2,400	0.01	30,837,047	100.00
Utah	1,855,476	12.08	0	0.00	13,470,270	87.70	34,256	0.22	0	0.00	15,360,002	100.00
Vermont	0	0.00	0	0.00	24,091	98.97	250	1.03	0	0.00	24,341	100.00
Virgin Islands	19,000	13.54	121,342	86.46	0	0.00	0	0.00	0	0.00	140,342	100.00
Virginia	1,579,508	31.22	43,275	0.86	3,426,354	67.72	10,141	0.20	0	0.00	5,059,278	100.00
Washington	644,204	70.45	230,669	25.23	25,962	2.84	13,359	1.46	250	0.03	914,424	100.00
West Virginia	269,175	37.91	343,519	48.37	9,000	1.27	88,423	12.45	0	0.00	710,117	100.00
Wisconsin	4,433,633	63.84	94,981	1.37	1,855,834	26.72	559,376	8.05	1,000	0.01	6,944,824	100.00
Wyoming	179,237	1.17	1,329	0.01	15,048,396	98.52	45,405	0.30	0	0.00	15,274,367	100.00
TOTAL	223,563,873	39.81	11,205,201	2.00	106,817,672	19.02	219,763,632	39.13	206,504	0.04	561,556,882	100.00

Table D-5. States Shipping and Receiving TRI Wastes (Off-Site Transfers), 1988.

STATE RECEIVING WASTE	STATE SHIPPING WASTE								
	AL Pounds	AK Pounds	AS Pounds	AZ Pounds	AR Pounds	CA Pounds	CO Pounds	CT Pounds	DE Pounds
Alabama	7,271,548	0	0	0	135,431	0	0	20,864	21,127
Alaska	0	167,000	0	0	0	10,810	0	0	0
American Samoa	0	0	0	0	0	0	0	0	0
Arizona	0	0	0	548,054	0	406,023	0	0	0
Arkansas	197,936	33,360	0	80,734	1,795,332	218,005	53,020	1,801	49,582
California	0	0	0	491,619	0	34,130,575	150	191,442	0
Colorado	0	0	0	0	0	0	1,393,167	24,000	0
Connecticut	0	0	0	0	0	0	0	6,720,334	0
Delaware	0	0	0	0	0	0	0	0	1,496,036
District of Columbia	0	0	0	0	0	0	0	0	0
Florida	45,085	0	0	0	0	0	0	9,800	0
Georgia	51,412	0	0	0	9,907	0	0	0	0
Hawaii	0	0	0	0	0	0	0	0	0
Idaho	0	0	0	0	0	303,853	1,000	0	0
Illinois	169,319	0	0	29,200	0	14,410	48,741	313,199	0
Indiana	3,648	0	0	0	616,704	0	0	0	0
Iowa	0	0	0	0	0	0	0	0	0
Kansas	75	0	0	0	0	1,087,143	13,750	1	0
Kentucky	70,559	0	0	750	711,558	0	319,360	750	0
Louisiana	3,187,755	0	0	6,647	940,635	664,670	33,750	36,141	104,519
Maine	0	0	0	0	0	0	0	0	0
Maryland	0	0	0	0	0	0	0	27,025	9,581
Massachusetts	0	0	0	0	0	0	0	2,074,675	0
Michigan	15,467	0	0	0	9,213	108,798	0	162,442	19,100
Minnesota	976,910	0	0	0	0	33,100	1,565	0	0
Mississippi	0	0	0	0	0	0	0	0	0
Missouri	0	0	0	0	10,354	290,020	3,210	0	0
Montana	0	0	0	0	0	0	0	0	0
Nebraska	0	0	0	0	0	0	0	0	0
Nevada	0	0	0	10,645	0	167,363	7,280	0	0
New Hampshire	0	0	0	0	0	0	0	0	0
New Jersey	7,400	0	0	0	0	53,258	0	2,605,641	487,904
New Mexico	0	0	0	0	0	0	2	0	0
New York	3,000	0	0	0	0	250	874,000	1,289,896	65,490
North Carolina	51,784	0	0	0	0	5,720	0	0	48,730
North Dakota	0	0	0	0	0	0	0	0	0
Ohio	6,000	0	0	0	0	154,276	1,020	150,633	148,938
Oklahoma	547,100	0	0	0	221,322	12,096	447,027	0	0
Oregon	0	0	0	0	0	37	0	0	0
Pennsylvania	108,891	0	0	830	0	0	1,511,500	3,297,556	58,532
Puerto Rico	0	0	0	147	0	0	0	0	0
Rhode Island	0	0	0	0	0	0	0	8,020	0
South Carolina	27,326	0	0	0	9,500	1,830	2,088	38,430	98,062
South Dakota	0	0	0	0	0	0	0	0	0
Tennessee	1,378,206	0	0	0	622,681	0	1,358	250	0
Texas	582,870	0	0	386,470	2,855,799	699,812	306,644	6,400	2,100
Utah	0	0	0	22,122	0	2,407,369	394,440	0	0
Vermont	0	0	0	0	0	0	0	0	0
Virgin Islands	0	0	0	0	0	0	0	0	0
Virginia	0	0	0	0	0	0	0	160	0
Washington	7,600	1,950	0	0	0	4,200	0	0	0
West Virginia	17,000	0	0	0	0	0	0	0	88,060
Wisconsin	0	0	0	0	0	0	0	0	0
Wyoming	0	0	0	0	0	29,700	0	0	0
Unknown	747,171	0	0	1,265	3,256	433,932	2,040	742,631	24,342
TOTAL	**15,474,082**	**202,310**	**0**	**1,578,483**	**7,941,692**	**41,237,250**	**5,415,112**	**17,722,091**	**2,722,103**

Table D-5. States Shipping and Receiving TRI Wastes (Off-site Transfers), 1988, continued.

STATE RECEIVING WASTE	STATE SHIPPING WASTE								
	DC Pounds	FL Pounds	GA Pounds	HI Pounds	ID Pounds	IL Pounds	IN Pounds	IA Pounds	KS Pounds
Alabama	0	1,420,160	2,643,303	0	0	2,288,585	111,284	175,065	18,263
Alaska	0	0	0	0	0	0	0	0	0
American Samoa	0	0	0	0	0	0	0	0	0
Arizona	0	0	0	0	0	616,400	0	0	0
Arkansas	0	55,083	98,438	0	0	260,664	107,697	4,541	134,561
California	0	280	0	1,932	0	0	0	0	0
Colorado	0	0	0	0	87,214	0	0	0	0
Connecticut	0	37,000	0	0	0	0	0	0	0
Delaware	0	0	0	0	0	0	0	0	0
District of Columbia	0	0	0	0	0	0	0	0	0
Florida	0	8,316,789	83,879	0	0	10	0	0	0
Georgia	0	357,074	13,525,535	0	0	781	76,122	0	0
Hawaii	0	0	0	11,750	0	0	0	0	0
Idaho	0	0	0	0	44,326	0	0	0	4,250
Illinois	0	207,050	3,120	0	0	31,266,849	11,483,436	3,020,900	29,550
Indiana	0	10,387	0	0	0	10,147,067	31,292,033	110,437	3,500
Iowa	0	0	0	0	0	0	0	2,852,588	0
Kansas	0	0	0	0	0	18,487	104,930	44,556	52,963,357
Kentucky	0	57,062	57,572	0	0	2,270,686	1,889,024	151,146	18,591
Louisiana	0	173,667	889,414	0	0	1,431,722	380,847	58,442	82,587
Maine	0	0	0	0	0	0	0	0	0
Maryland	0	4,628	0	0	0	0	1,200	0	0
Massachusetts	0	0	0	0	0	45,273	0	0	0
Michigan	0	212,028	94	0	0	867,327	2,399,765	1,000	3,500
Minnesota	0	0	0	0	0	510,260	429,924	217,850	0
Mississippi	0	0	0	0	0	0	0	0	0
Missouri	0	0	0	0	0	440,146	0	74,483	212,892
Montana	0	0	0	0	0	0	256,403	0	119,598
Nebraska	0	0	0	0	0	0	0	5,144	0
Nevada	0	0	0	0	0	0	0	3,311	0
New Hampshire	0	0	0	0	0	0	0	0	0
New Jersey	0	11,550	79,374	0	0	23,000	0	0	0
New Mexico	0	0	0	0	0	0	0	0	0
New York	0	216,003	0	0	0	1	0	0	0
North Carolina	250	82	48,879	0	0	250	0	0	0
North Dakota	0	0	0	0	0	0	0	0	0
Ohio	0	346,791	58,700	0	0	2,327,687	1,100,645	49,860	18,500
Oklahoma	0	0	0	0	0	103	6,131	0	764,376
Oregon	0	0	0	0	3,255	0	0	0	0
Pennsylvania	0	340	5,449,792	0	0	4,324	364,667	0	0
Puerto Rico	0	0	0	0	0	0	0	0	0
Rhode Island	0	0	0	0	0	0	0	0	0
South Carolina	0	1,231,317	646,224	0	0	126,252	6,657	0	0
South Dakota	0	0	0	0	0	0	0	0	0
Tennessee	0	0	194,195	0	0	53,736	68,042	5,150	10,008
Texas	0	0	441,496	0	0	146,551	1,250	4,550	6,263
Utah	0	0	250	0	0	0	0	0	0
Vermont	0	0	0	0	0	0	0	0	0
Virgin Islands	0	0	0	0	0	0	0	0	0
Virginia	0	368,287	0	0	0	0	0	0	0
Washington	0	0	0	0	1,800	0	0	0	0
West Virginia	0	0	0	0	0	0	1,297	0	0
Wisconsin	0	0	0	0	0	1,880,139	1,009,862	686,362	13,065
Wyoming	0	0	0	0	0	0	0	0	0
Unknown	0	1,764,044	251,846	0	0	717,842	375,166	2,250	15,593
TOTAL	250	14,789,622	24,472,111	13,682	136,595	55,444,122	51,466,382	7,467,635	54,398,484

Table D-5. States Shipping and Receiving TRI Wastes (Off-Site Transfers), 1988, continued.

STATE RECEIVING WASTE	STATE SHIPPING WASTE								
	KY Pounds	LA Pounds	ME Pounds	MD Pounds	MA Pounds	MI Pounds	MN Pounds	MS Pounds	MO Pounds
Alabama	944,839	329,192	3,700	24,343	0	191,053	54,710	3,811,248	108,648
Alaska	0	0	0	0	0	0	0	0	0
American Samoa	0	0	0	0	0	0	0	0	0
Arizona	0	0	0	0	0	0	16,968	0	248,992
Arkansas	8,638	494,601	0	134,587	58,425	239,507	507,237	112,944	461,494
California	0	0	0	0	279,650	317,600	2,300	250	0
Colorado	0	0	0	0	0	0	0	0	0
Connecticut	0	0	98,018	0	5,495,276	0	0	0	0
Delaware	0	0	0	0	0	0	0	0	0
District of Columbia	0	0	0	750	0	0	0	0	0
Florida	0	0	0	3,027	0	0	0	21,000	0
Georgia	508,870	0	0	5,954	0	58,584	0	361	43,393
Hawaii	0	0	0	0	0	0	0	0	0
Idaho	0	0	0	0	0	0	0	0	16,820
Illinois	687,123	8,250	0	0	199,580	3,721,295	555,200	6,423	1,416,697
Indiana	8,538,908	0	0	34,776	525	1,939,733	22,025	0	926,335
Iowa	0	0	0	0	0	0	9,735	0	250
Kansas	500	223,471	0	0	0	315,280	248	0	1,591,515
Kentucky	18,906,042	0	0	27,450	34,810	853,552	24,986	28,718	1,015,483
Louisiana	78,278	19,844,565	300	0	283,466	45,823	94,111	703,299	256,180
Maine	0	0	334,317	0	5,150	0	0	0	0
Maryland	0	0	0	1,115,871	145,288	2,808	0	0	0
Massachusetts	0	0	573,862	0	7,472,289	77,440	0	0	0
Michigan	737,779	10,500	0	171,180	2,976	70,575,564	84,862	29,082	316,661
Minnesota	47,000	0	0	0	0	17,200	3,064,212	0	689,437
Mississippi	11,541	5,907	0	0	0	0	0	574,895	1,835
Missouri	56,400	0	0	0	0	0	0	0	2,180,112
Montana	0	0	0	0	250	0	0	0	0
Nebraska	0	0	0	0	0	0	750	0	0
Nevada	0	0	0	0	35,539	60	0	0	0
New Hampshire	0	0	750	0	348,535	0	0	0	0
New Jersey	427,200	0	155,950	716,030	1,688,729	45,662	16,274	0	0
New Mexico	0	0	0	0	0	0	0	0	0
New York	15,750	0	253	3,775	8,146,629	0	1,527	918	750
North Carolina	25,664	0	0	96,140	0	0	500	0	0
North Dakota	0	0	0	0	0	0	0	0	0
Ohio	1,087,964	0	0	132,863	202,484	15,480,170	750	0	2,650,071
Oklahoma	0	0	0	0	0	0	63,518	0	1,069,452
Oregon	0	0	0	0	0	8,725	0	0	0
Pennsylvania	861,285	0	16,000	2,404,911	38,397	23,400	230	0	118
Puerto Rico	0	0	0	0	0	0	0	0	0
Rhode Island	0	0	0	0	39,398	0	0	0	0
South Carolina	118,542	750	0	185,427	124,133	30,292	1,073	14,230	21,367
South Dakota	0	0	0	0	0	0	0	0	0
Tennessee	14,627,193	250	0	750	0	60,704	0	1,537,247	189,551
Texas	250	968,075	0	1,466	0	189,623	0	852,500	444,309
Utah	0	0	0	0	0	0	22	0	47,320
Vermont	0	0	24,756	0	0	0	0	0	0
Virgin Islands	0	0	0	0	0	0	0	0	0
Virginia	0	0	0	32,560	851,077	0	0	0	0
Washington	3,437	0	0	0	0	0	0	0	0
West Virginia	70	0	0	0	1,550	0	0	0	0
Wisconsin	6,127	0	0	0	0	17,576	1,380,907	0	11,669
Wyoming	0	0	0	0	0	0	0	0	0
Unknown	85,978	11,974	74,727	482,610	614,154	1,636,869	13,085	250	406,638
TOTAL	47,787,378	21,897,535	1,282,633	5,574,470	26,068,310	95,848,610	5,913,230	7,693,365	14,113,087

Table D-5. States Shipping and Receiving TRI Wastes (Off-Site Transfers), 1988, continued.

STATE RECEIVING WASTE	STATE SHIPPING WASTE								
	MT Pounds	NE Pounds	NV Pounds	NH Pounds	NJ Pounds	NM Pounds	NY Pounds	NC Pounds	ND Pounds
Alabama	0	2,420	0	34,237	61,399	0	41,501	1,039,584	1,783
Alaska	0	1,787	0	0	0	0	0	0	0
American Samoa	0	0	0	0	0	0	0	0	0
Arizona	0	0	0	0	0	0	0	0	0
Arkansas	0	16,804	0	0	128,829	5,820	1,057,007	86,469	0
California	0	0	548,185	0	0	0	54,906	0	0
Colorado	0	0	0	0	0	750	0	0	0
Connecticut	0	0	0	213,704	2,767	0	533,563	6,573	0
Delaware	0	0	0	0	0	0	0	0	0
District of Columbia	0	0	0	0	0	0	0	0	0
Florida	0	0	0	0	890	0	130	143,818	0
Georgia	0	0	0	0	0	0	0	522,835	0
Hawaii	0	0	0	0	0	0	0	0	0
Idaho	0	0	0	0	0	0	0	0	0
Illinois	0	234,096	0	0	43,526	0	100,107	11,750	0
Indiana	0	0	3,150	0	397,114	0	34,750	668,552	250
Iowa	0	0	0	0	0	0	0	0	0
Kansas	4,140	110,176	0	0	500	0	4,550	0	12,500
Kentucky	0	27,266	0	0	1,019,272	0	1,255,697	678,333	0
Louisiana	0	86,580	1,000	2,275	681,922	0	127,003	8,959	19,663
Maine	0	0	0	5	0	0	0	0	0
Maryland	0	0	0	0	767,476	0	23,414	6,045	0
Massachusetts	0	0	0	855,303	0	0	230,023	0	0
Michigan	0	780	0	750	556,266	0	466,769	102,958	0
Minnesota	0	0	0	0	83,538	0	50,000	0	38,154
Mississippi	0	5,000	0	0	0	0	0	0	0
Missouri	0	12,262	0	0	0	0	0	0	0
Montana	364	0	0	0	0	0	0	0	0
Nebraska	0	2,708,084	0	0	0	0	0	0	0
Nevada	0	0	47,245	0	0	0	0	0	0
New Hampshire	0	0	0	135,045	0	0	97	0	0
New Jersey	0	0	0	266,103	17,024,699	0	5,961,446	203,028	0
New Mexico	0	0	0	0	0	32,040	0	0	0
New York	0	75	0	22,408	973,930	0	36,044,892	2,612	0
North Carolina	0	0	0	75,829	12,507	0	2,194	11,610,274	0
North Dakota	0	0	0	0	0	0	0	0	5,910
Ohio	0	101,920	0	1,430	4,161,202	0	2,232,403	73,483	0
Oklahoma	0	157,477	0	0	0	82,520	0	0	0
Oregon	750	0	0	0	0	0	0	0	0
Pennsylvania	0	0	0	345,649	13,093,404	0	1,395,714	12,472	0
Puerto Rico	0	0	0	0	0	0	0	0	0
Rhode Island	0	0	0	0	8,265	0	1,518	0	0
South Carolina	0	0	0	1,750	276,387	0	336,077	3,879,876	0
South Dakota	0	5,500	0	0	0	0	0	37,232	0
Tennessee	500	0	0	0	750	500	53,687	123,155	0
Texas	0	342,220	700	0	276,691	7,200	700	0	85
Utah	40,300	0	17,750	0	0	81,950	0	0	1,962
Vermont	0	0	0	0	0	0	1,000	0	0
Virgin Islands	0	0	0	0	0	0	0	0	0
Virginia	0	0	0	750	473,750	0	0	1,257,983	0
Washington	316	0	0	0	0	0	0	0	0
West Virginia	0	0	0	0	1,600	0	0	11,779	0
Wisconsin	0	28,984	0	0	0	0	0	0	20,980
Wyoming	0	0	0	0	0	0	0	0	0
Unknown	0	250	21,366	143,323	28,468,315	0	420,862	237,373	0
TOTAL	46,370	3,841,681	639,396	2,098,561	68,514,999	210,780	50,430,010	20,725,143	101,287

Table D-5. States Shipping and Receiving TRI Wastes (Off-Site Transfers), 1988, continued.

STATE RECEIVING WASTE	STATE SHIPPING WASTE								
	OH Pounds	OK Pounds	OR Pounds	PA Pounds	PR Pounds	RI Pounds	SC Pounds	SD Pounds	TN Pounds
Alabama	261,536	0	18,865	439,470	8,779	0	889,037	0	2,807,050
Alaska	0	0	0	22,032	0	0	0	0	0
American Samoa	0	0	0	0	0	0	0	0	0
Arizona	0	0	0	10,819	1,000	0	0	0	0
Arkansas	258,105	83,603	360,000	311,222	8,727	0	351,934	680	490,773
California	0	0	2,054	5,300	0	13	0	0	0
Colorado	0	0	0	0	0	0	0	0	0
Connecticut	250	0	0	219,192	0	310,108	0	0	0
Delaware	0	0	0	3	0	0	0	0	0
District of Columbia	0	0	0	0	0	0	0	0	0
Florida	0	0	0	0	0	0	107,980	0	750
Georgia	146,130	165,500	0	24,433	0	0	109,141	0	494,021
Hawaii	0	0	0	0	0	0	0	0	0
Idaho	0	0	11,003	0	0	0	0	0	0
Illinois	668,896	2,200	5,720	288,846	0	0	55	0	51,192
Indiana	5,942,140	0	0	691,903	0	0	5,000	25,094	72,651
Iowa	0	0	0	0	0	0	0	8,300	0
Kansas	266,211	529,913	220,496	40,270	0	0	0	0	166,554
Kentucky	1,735,495	250	8	1,805,191	0	19,838	37,000	6,500	137,571
Louisiana	821,910	495,369	481	157,446	6,025	37,115	45,429	3,850	1,260,400
Maine	0	0	0	0	0	0	0	0	0
Maryland	20,219	0	0	654,451	0	27,558	0	0	5,150
Massachusetts	0	0	0	0	0	1,112,573	0	0	0
Michigan	19,518,328	0	0	2,180,438	0	0	19,811	0	161,110
Minnesota	10,400	350,740	7,542	1,750	4,900	0	10,900	50,077	0
Mississippi	0	0	0	3	0	0	0	0	338,197
Missouri	0	2,350	1,750	0	0	0	0	0	250
Montana	0	0	0	0	0	0	0	0	21,722
Nebraska	0	0	0	0	0	0	0	100,793	0
Nevada	0	0	0	0	0	0	0	0	12
New Hampshire	0	0	0	0	0	0	0	0	0
New Jersey	42,116	0	0	7,918,160	390	305,137	49,875	0	230,937
New Mexico	0	130,000	0	0	0	0	0	0	0
New York	656,864	0	0	2,298,007	0	582,500	0	0	260,200
North Carolina	0	0	0	231,367	0	0	991,810	0	75,303
North Dakota	0	0	0	0	0	0	0	0	0
Ohio	87,767,972	0	0	22,585,559	0	0	3,772	16,254	21,942
Oklahoma	0	7,837,180	0	0	0	0	0	0	0
Oregon	0	0	3,827,746	0	0	0	0	0	0
Pennsylvania	3,732,290	0	3,002	35,876,753	0	61,606	0	0	43,480
Puerto Rico	0	0	0	0	4,983,546	0	0	0	0
Rhode Island	0	0	0	15	0	1,831,272	750	0	0
South Carolina	499,897	0	0	5,988,959	240	0	11,118,006	0	864,625
South Dakota	0	0	0	0	0	0	0	120,351	0
Tennessee	41,329	17,900	0	12,547	0	750	117,400	0	13,552,949
Texas	316,775	2,002,074	0	1,353,750	580	0	0	0	2,863
Utah	0	0	358,789	250	0	0	0	5,485	0
Vermont	0	0	0	0	0	0	0	0	0
Virgin Islands	0	0	0	0	0	0	0	0	0
Virginia	0	0	0	220,117	0	0	0	0	431,172
Washington	0	0	496,176	0	0	0	0	0	0
West Virginia	403,910	0	0	28,678	0	0	0	0	87,737
Wisconsin	1,050,651	0	0	0	0	0	0	84,000	0
Wyoming	0	0	0	0	0	0	0	0	0
Unknown	160,883	73,288	0	431,254	1,500	32,823	112,476	0	2,603
TOTAL	**124,322,308**	**11,690,367**	**5,313,630**	**83,798,182**	**5,015,687**	**4,321,293**	**13,970,378**	**421,384**	**21,581,214**

Table D-5. States Shipping and Receiving TRI Wastes (Off-Site Transfers), 1988, continued.

STATE RECEIVING WASTE	STATE SHIPPING WASTE									TOTAL OFF-SITE Pounds
	TX Pounds	UT Pounds	VT Pounds	VI Pounds	VA Pounds	WA Pounds	WV Pounds	WI Pounds	WY Pounds	
Alabama	560,562	0	0	0	5,348,102	1,000	23,817	212,774	0	31.325.279
Alaska	0	0	0	0	81,360	0	0	0	0	282.989
American Samoa	0	0	0	0	0	0	0	0	0	0
Arizona	0	21,600	0	0	0	28,105	0	12,790	0	1.908.751
Arkansas	510,424	6,017	0	0	36,998	0	1,106,199	28,396	0	9.956.284
California	39,555	0	1,750	0	0	107,245	0	0	0	36.174.806
Colorado	9,600	201,116	0	0	0	0	0	0	0	1.715.847
Connecticut	341	0	271,372	0	656	0	0	0	0	13,909.134
Delaware	0	0	0	0	0	0	0	0	0	1.496.039
District of Columbia	0	0	0	0	0	0	0	0	0	750
Florida	0	0	0	0	8,920	0	0	0	0	8,742.078
Georgia	0	0	0	0	31,032	0	500	0	0	16,131,585
Hawaii	0	0	0	0	0	0	0	0	0	11,750
Idaho	0	0	0	0	0	76,922	0	0	0	486,174
Illinois	29,050	8,750	0	0	3,845	32,770	746,264	5,101,132	0	80,508,541
Indiana	1,250	0	0	0	49,607	0	149,000	319,253	0	82,005,792
Iowa	0	0	0	0	0	0	0	57,000	0	2,927,873
Kansas	134,435	0	25,000	0	428	35,860	0	303,981	0	58,218,327
Kentucky	110,601	0	0	0	97,977	0	167,126	642,381	0	34,178,605
Louisiana	11,422,927	0	8,950	0	132,757	8,400	403,380	67,866	0	45,096,545
Maine	0	0	0	0	0	0	0	0	0	339,472
Maryland	28	0	0	0	173,487	0	841	1,000	0	2,986,070
Massachusetts	0	0	169,964	0	0	0	0	0	0	12,611,402
Michigan	0	0	0	0	1,905	0	460	1,347,283	0	100,083,998
Minnesota	578,470	0	0	0	0	0	207,655	263,116	0	7,644,880
Mississippi	250	0	0	0	0	0	0	0	0	937,825
Missouri	118,600	0	0	0	0	10,300	37,000	0	0	3,450,129
Montana	0	0	0	0	0	0	0	0	0	398,337
Nebraska	0	0	0	0	0	0	0	0	0	2,814,771
Nevada	0	13,779	0	0	0	1,230	0	0	0	288,484
New Hampshire	0	0	0	0	0	0	0	0	0	484,427
New Jersey	205,200	0	9,006	0	1,827,452	0	847,223	207,993	0	41,416,738
New Mexico	0	0	0	0	0	0	0	0	0	182,042
New York	0	0	45,678	0	259	0	177,842	0	0	51,883,509
North Carolina	0	0	0	0	795,040	0	2,577	750	0	14,075,850
North Dakota	0	0	0	0	0	0	0	0	0	5,910
Ohio	134,034	0	0	0	491,963	0	10,568,993	2,507,095	0	154,585,374
Oklahoma	418,867	0	0	0	0	0	0	0	0	11,807,169
Oregon	0	643	0	0	0	679,926	0	0	0	4,521,082
Pennsylvania	228,213	0	0	0	17,441	0	468,813	16,960	0	89,438,570
Puerto Rico	0	0	0	0	0	0	0	0	0	4,983,693
Rhode Island	0	0	0	0	0	0	0	0	0	1,889,238
South Carolina	24,650	0	0	0	400,451	0	316,762	7,830	0	26,399,010
South Dakota	0	0	0	0	0	0	0	0	0	183,083
Tennessee	54,251	0	0	0	83,147	0	936	18,653	250	32,828,025
Texas	71,268,157	17,559	0	0	0	24,112	149,889	17,255	89,620	83,768,658
Utah	34,957	1,276,066	0	0	0	1,668	0	0	11,656	4,702,358
Vermont	0	0	26,277	0	0	0	0	0	0	52,033
Virgin Islands	0	0	0	0	0	0	0	0	0	0
Virginia	0	0	0	0	3,739,278	0	86,145	0	0	7,481,279
Washington	0	0	0	0	0	6,020,215	0	18,630	0	6,554,322
West Virginia	1,489,725	0	0	0	800	0	3,271,394	0	0	5,403,600
Wisconsin	74,500	0	0	0	1,000	0	0	19,274,516	0	25,540,338
Wyoming	0	0	0	0	0	0	0	0	0	29,700
Unknown	662,010	635	87,142	0	156,608	302,962	14,460	322,633	0	40,080,429
TOTAL	88,110,657	1,546,165	645,139	0	13,480,483	7,330,718	18,747,278	30,748,287	101,526	1,104,414,307

Table D-6. TRI Releases and Transfers by Industry for the Top 25 Chemicals, 1988.

CAS NO.	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	FOOD SIC 20 Percent	TOBACCO SIC 21 Percent	TEXTILES SIC 22 Percent	APPAREL SIC 23 Percent	LUMBER SIC 24 Percent	FURNITURE SIC 25 Percent	PAPER SIC 26 Percent
007783202	AMMONIUM SULFATE (SOLUTION)	745,528,007	2.10	0.00	0.43	0.00	0.12	0.00	8.21
007647010	HYDROCHLORIC ACID	635,720,989	0.47	0.00	0.00	0.00	0.00	0.01	4.24
000067561	METHANOL	435,639,693	0.21	2.28	0.77	0.00	0.35	2.40	27.21
007664939	SULFURIC ACID	386,060,541	3.75	0.17	1.55	0.05	0.05	0.04	3.76
007664417	AMMONIA	356,101,165	4.10	0.22	0.67	0.00	0.16	0.00	1.57
000108883	TOLUENE	333,315,437	0.09	0.08	2.48	0.07	2.27	5.41	13.40
000067641	ACETONE	249,703,395	0.44	0.42	0.77	0.07	0.47	2.25	7.83
007664382	PHOSPHORIC ACID	241,602,716	3.51	0.01	0.54	0.00	0.04	0.06	0.13
	ZINC COMPOUNDS	209,127,626	0.07	0.00	0.01	0.00	0.00	0.00	0.77
001330207	XYLENE (MIXED ISOMERS)	181,771,506	0.02	0.00	1.73	0.03	3.69	6.16	1.84
000071556	1,1,1-TRICHLOROETHANE	180,418,488	0.07	0.00	2.55	0.02	0.11	1.43	1.76
000078933	METHYL ETHYL KETONE	156,490,232	0.03	0.00	6.38	0.18	1.61	3.70	5.28
007782505	CHLORINE	147,050,483	1.28	0.24	0.93	0.00	0.00	0.00	11.60
000075092	DICHLOROMETHANE	134,212,442	0.29	0.00	0.37	0.05	0.20	0.26	0.38
	MANGANESE COMPOUNDS	114,926,157	0.00	0.00	0.02	0.00	0.01	0.00	0.02
006484522	AMMONIUM NITRATE (SOLUTION)	107,223,350	0.01	0.02	0.02	0.00	0.00	0.00	0.36
000075150	CARBON DISULFIDE	82,748,299	0.00	0.02	0.00	0.00	0.00	0.00	0.28
007697372	NITRIC ACID	81,288,357	4.27	0.00	0.00	0.04	0.00	0.01	0.91
000076131	FREON 113	68,545,125	0.38	0.06	0.18	0.00	0.00	0.02	0.00
007440666	ZINC (FUME OR DUST)	66,013,145	0.01	0.00	0.00	0.00	0.00	0.02	0.42
	GLYCOL ETHERS	62,255,269	0.18	0.00	2.06	0.00	0.65	2.18	1.43
000107211	ETHYLENE GLYCOL	55,713,223	6.07	0.00	2.11	0.00	0.21	0.07	0.69
	COPPER COMPOUNDS	53,087,237	0.02	0.00	0.05	0.00	0.18	0.02	0.00
000079016	TRICHLOROETHYLENE	52,616,792	0.00	0.00	2.30	0.00	0.02	0.32	0.12
000071363	N-BUTYL ALCOHOL	52,004,930	0.16	0.00	0.11	0.00	2.01	5.18	1.09
	TOTAL	6,241,030,746	1.17	0.24	0.98	0.03	0.83	1.01	8.93

Table D-6. TRI Releases and Transfers by Industry for the Top 25 Chemicals, 1988. (Cont.)

CHEMICAL	PRINTING SIC 27 Percent	CHEMICALS SIC 28 Percent	PETROLEUM SIC 29 Percent	PLASTICS SIC 30 Percent	LEATHER SIC 31 Percent	STONE/CLAY SIC 32 Percent	PRIMARY METALS SIC 33 Percent	FAB. METALS SIC 34 Percent
AMMONIUM SULFATE (SOL'N)	0.00	83.24	0.53	0.45	1.46	0.10	0.85	0.04
HYDROCHLORIC ACID	0.11	58.08	0.01	0.02	0.00	0.31	6.37	2.12
METHANOL	0.23	45.09	0.51	3.96	0.00	0.41	0.53	0.19
SULFURIC ACID	0.27	47.18	0.19	0.21	1.62	1.91	22.96	7.07
AMMONIA	0.03	65.65	9.13	0.60	1.05	1.03	6.67	0.28
TOLUENE	11.89	23.46	4.26	7.89	1.03	1.02	1.70	3.28
ACETONE	0.29	43.86	0.07	9.67	1.00	0.39	0.21	1.72
PHOSPHORIC ACID	0.23	90.17	0.54	0.04	0.01	0.09	1.13	1.71
ZINC COMPOUNDS	0.89	4.07	0.24	2.39	0.00	0.24	82.13	3.73
XYLENE (MIXED ISOMERS)	0.84	20.68	4.45	3.76	0.77	0.75	3.21	8.80
1,1,1-TRICHLOROETHANE	1.95	3.22	0.15	7.08	0.19	0.55	9.72	13.16
METHYL ETHYL KETONE	2.66	11.17	4.45	12.59	1.78	1.06	3.38	6.89
CHLORINE	0.00	10.10	0.30	0.13	0.00	0.01	72.55	0.27
DICHLOROMETHANE	0.25	32.15	0.00	17.75	0.23	1.62	1.40	2.86
MANGANESE COMPOUNDS	0.00	16.37	0.12	0.00	0.03	0.29	34.31	0.02
AMMONIUM NITRATE (SOL'N)	0.00	96.77	0.01	0.00	0.00	0.34	0.18	0.00
CARBON DISULFIDE	0.00	83.73	0.01	15.87	0.00	0.07	0.03	0.00
NITRIC ACID	1.20	53.39	0.00	0.11	0.00	0.06	14.38	6.82
FREON 113	0.00	2.78	0.01	3.32	0.03	0.15	1.86	5.63
ZINC (FUME OR DUST)	0.00	7.09	0.23	0.07	0.00	0.06	81.46	3.76
GLYCOL ETHERS	3.11	13.25	0.19	2.44	2.29	1.13	2.63	30.97
ETHYLENE GLYCOL	0.64	62.03	0.45	1.51	0.00	0.42	6.28	2.12
COPPER COMPOUNDS	0.26	5.21	0.23	0.17	0.00	0.03	77.29	4.10
TRICHLOROETHYLENE	0.33	3.10	0.06	3.60	0.02	0.44	7.03	22.92
N-BUTYL ALCOHOL	0.17	30.89	0.02	1.32	0.37	0.21	0.95	26.21
TOTAL	0.97	46.20	1.87	3.03	0.81	0.86	13.78	3.48

Table D-6. TRI Releases and Transfers by Industry for the Top 25 Chemicals, 1988. (Cont.)

CHEMICAL	MACHINERY SIC 35 Percent	ELECTRICAL SIC 36 Percent	TRANSPORTATION SIC 37 Percent	MEASURE./PHOTO. SIC 38 Percent	MISCELLANEOUS SIC 39 Percent	MULTIPLE CODES 20-39 Percent	NO CODES 20-39 Percent
AMMONIUM SULFATE (SOL'N)	0.00	0.60	0.00	0.15	0.01	1.68	0.02
HYDROCHLORIC ACID	0.09	0.54	0.22	0.11	0.01	26.71	0.54
METHANOL	0.15	0.77	1.17	2.38	0.18	10.99	0.22
SULFURIC ACID	0.66	2.59	1.57	0.22	0.07	3.55	0.55
AMMONIA	0.11	0.67	0.25	0.08	0.01	7.29	0.43
TOLUENE	1.37	3.23	5.40	0.78	2.10	8.47	0.32
ACETONE	0.64	3.73	11.07	2.35	1.94	10.36	0.46
PHOSPHORIC ACID	0.28	0.46	0.21	0.06	0.02	0.61	0.15
ZINC COMPOUNDS	0.23	0.62	0.58	0.16	0.17	3.67	0.00
XYLENE (MIXED ISOMERS)	3.98	8.10	23.65	0.77	1.34	4.76	0.70
1,1,1-TRICHLOROETHANE	8.40	12.37	18.03	3.09	3.18	11.41	0.73
METHYL ETHYL KETONE	1.83	10.06	10.55	0.68	2.71	12.76	0.25
CHLORINE	0.05	0.36	0.13	0.00	0.00	1.88	0.16
DICHLOROMETHANE	1.54	8.82	6.46	11.09	2.12	11.89	0.26
MANGANESE COMPOUNDS	2.63	0.72	0.08	0.17	0.00	45.19	0.00
AMMONIUM NITRATE (SOL'N)	0.00	1.13	0.00	0.12	0.00	0.78	0.27
CARBON DISULFIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NITRIC ACID	2.62	3.43	5.85	0.43	0.18	5.95	0.33
FREON 113	11.93	28.82	15.12	12.25	0.99	15.15	1.34
ZINC (FUME OR DUST)	0.22	1.26	0.47	0.16	0.14	3.21	1.44
GLYCOL ETHERS	1.91	8.27	21.03	0.74	0.49	5.12	0.13
ETHYLENE GLYCOL	1.53	2.25	4.68	1.59	0.18	6.64	0.71
COPPER COMPOUNDS	0.24	3.44	5.49	0.33	0.10	2.40	0.43
TRICHLOROETHYLENE	11.74	12.92	12.78	2.84	3.14	15.73	0.61
N-BUTYL ALCOHOL	1.13	2.68	18.67	0.87	0.59	7.22	0.13
TOTAL	1.21	2.92	4.18	1.03	0.58	9.29	0.37

Table D-7. TRI Releases and Transfers for the Top 25 Carcinogens, 1988.

CAS NO.	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	FOOD SIC 20 Percent	TOBACCO SIC 21 Percent	TEXTILES SIC 22 Percent	APPAREL SIC 23 Percent	LUMBER SIC 24 Percent
000075092	DICHLOROMETHANE	134,212,442	0.29	0.00	0.37	0.05	0.20
000100425	STYRENE	42,760,770	0.00	0.07	0.00	0.00	0.14
000127184	TETRACHLOROETHYLENE	35,879,858	0.00	0.00	3.93	0.85	0.09
000071432	BENZENE	33,245,252	0.01	0.00	0.00	0.00	0.02
000050000	FORMALDEHYDE	30,766,305	0.01	0.00	1.46	0.00	13.71
000067663	CHLOROFORM	26,604,039	0.15	2.75	0.00	0.00	0.00
000075058	ACETONITRILE	23,585,619	0.00	0.00	0.00	0.00	0.00
001332214	ASBESTOS (FRIABLE)	22,607,674	0.32	0.00	0.00	0.00	0.00
007439921	LEAD	22,434,784	0.05	0.00	0.03	0.00	0.00
007440473	CHROMIUM	21,296,563	0.00	0.00	0.01	0.00	0.09
000107131	ACRYLONITRILE	10,841,495	0.00	0.00	0.00	0.00	0.00
001336363	POLYCHLORINATED BIPHENYLS (PCBs)	9,286,906	0.19	0.97	0.89	0.00	0.32
007440020	NICKEL	8,999,971	1.88	0.00	0.00	0.00	0.00
000107062	1,2-DICHLOROETHANE	7,567,049	0.00	0.00	0.00	0.00	0.00
000106990	1,3-BUTADIENE	7,212,227	0.00	0.00	0.00	0.00	0.00
000056235	CARBON TETRACHLORIDE	5,085,155	0.00	0.00	0.00	0.00	0.00
000075218	ETHYLENE OXIDE	5,053,707	4.15	0.00	0.00	0.00	0.00
000075569	PROPYLENE OXIDE	4,625,911	7.08	0.00	0.00	0.00	0.00
000117817	DI-(2-ETHYLHEXYL) PHTHALATE	3,506,080	0.00	0.00	9.49	0.16	0.26
000075014	VINYL CHLORIDE	2,072,382	0.00	0.00	0.00	0.00	0.00
000106467	1,4-DICHLOROBENZENE	2,007,383	0.00	0.00	0.00	0.00	0.00
000067630	ISOPROPYL ALCOHOL (MANUFACTURING)	1,672,949	0.96	0.00	3.31	0.00	4.76
000123911	1,4-DIOXANE	1,092,862	0.00	0.00	0.00	0.00	0.00
000079061	ACRYLAMIDE	1,032,887	0.00	0.05	0.00	0.00	0.00
000118741	HEXACHLOROBENZENE	970,287	0.00	0.00	0.00	0.00	0.00
	TOTAL	6,241,030,748	1.17	0.24	0.96	0.03	0.53

Table D-7. TRI Releases and Transfers for the Top 25 Carcinogens, 1988, continued.

CAS NO.	CHEMICAL	FURNITURE SIC 25 Percent	PAPER SIC 26 Percent	PRINTING SIC 27 Percent	CHEMICALS SIC 28 Percent	PETROLEUM SIC 29 Percent	PLASTICS SIC 30 Percent	LEATHER SIC 31 Percent	STONE/CLAY SIC 32 Percent
000075092	DICHLOROMETHANE	0.26	0.38	0.25	32.15	0.00	17.75	0.23	1.62
000100425	STYRENE	0.20	0.11	0.00	32.09	0.07	20.66	0.00	1.79
000127184	TETRACHLOROETHYLENE	0.20	0.52	0.48	8.40	0.04	2.59	0.14	0.24
000071432	BENZENE	0.00	0.00	0.00	36.95	14.13	0.00	0.00	0.00
000050000	FORMALDEHYDE	0.53	7.29	0.00	58.99	0.42	0.67	0.00	4.79
000067663	CHLOROFORM	0.00	69.10	0.00	16.36	0.00	0.00	0.00	0.00
000075058	ACETONITRILE	0.00	0.00	0.00	97.93	0.00	0.00	0.00	0.00
001332214	ASBESTOS (FRIABLE)	0.00	10.59	0.00	9.31	4.23	0.66	0.00	29.94
007439921	LEAD	0.01	0.00	0.08	3.06	0.86	2.03	0.00	1.59
007440473	CHROMIUM	0.05	0.11	0.01	1.95	1.16	0.05	2.20	2.22
000107131	ACRYLONITRILE	0.00	1.03	0.00	95.15	0.03	0.05	0.00	0.00
001336363	POLYCHLORINATED BIPHENYLS	0.33	12.92	0.00	2.54	0.10	0.14	0.00	0.29
007440020	NICKEL	0.43	0.00	0.00	3.22	4.01	0.60	0.00	1.06
000107062	1,2-DICHLOROETHANE	0.00	0.00	0.00	70.17	0.16	0.00	0.00	0.00
000106990	1,3-BUTADIENE	0.00	0.00	0.00	87.46	1.16	0.01	0.00	0.00
000056235	CARBON TETRACHLORIDE	0.00	0.00	0.00	87.67	0.52	0.02	0.00	0.00
000075218	ETHYLENE OXIDE	0.00	0.61	0.00	38.58	0.43	6.17	0.00	0.00
000075569	PROPYLENE OXIDE	0.00	0.00	0.00	90.37	0.00	0.00	0.00	0.01
000117817	DI-(2-ETHYLHEXYL) PHTHALATE	13.03	0.38	0.28	14.01	0.01	30.22	0.24	1.57
000075014	VINYL CHLORIDE	0.00	0.00	0.00	84.89	0.00	0.00	0.00	0.00
000106467	1,4-DICHLOROBENZENE	0.00	0.00	0.00	76.62	0.00	0.00	0.00	0.00
000067630	ISOPROPYL ALCOHOL (MANUF.)	5.89	7.07	12.46	14.26	0.00	9.51	0.39	1.16
000123911	1,4-DIOXANE	0.00	1.47	0.00	45.24	0.00	15.61	0.00	0.00
000079061	ACRYLAMIDE	0.00	0.03	0.00	99.91	0.00	0.00	0.00	0.00
000118741	HEXACHLOROBENZENE	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	TOTAL	1.01	5.93	0.97	48.20	1.67	3.03	0.81	0.88

Table D-7. TRI Releases and Transfers for the Top 25 Carcinogens, 1988, continued.

CAS NO.	CHEMICAL	PRIMARY METALS SIC 33 Percent	FAB. METALS SIC 34 Percent	MACHINERY SIC 35 Percent	ELECTRICAL SIC 36 Percent	TRANSPORTATION SIC 37 Percent	MEASURE./PHOTO. SIC 38 Percent
000075092	DICHLOROMETHANE	1.40	2.86	1.54	8.82	6.46	11.09
000100425	STYRENE	0.43	0.32	0.98	1.24	31.96	0.27
000127184	TETRACHLOROETHYLENE	6.91	11.50	4.74	12.93	22.73	2.15
000071432	BENZENE	34.30	0.00	0.19	0.00	3.54	0.00
000050000	FORMALDEHYDE	5.59	0.07	0.15	2.13	0.15	0.29
000067663	CHLOROFORM	0.00	0.00	0.00	0.01	0.11	0.02
000075058	ACETONITRILE	0.00	0.00	0.00	0.00	0.00	1.36
001332214	ASBESTOS (FRIABLE)	2.84	0.00	0.12	0.00	19.10	0.00
007439921	LEAD	70.96	3.79	0.45	9.24	1.10	0.28
007440473	CHROMIUM	46.54	10.01	9.69	2.00	5.90	0.34
000107131	ACRYLONITRILE	0.04	0.00	0.00	0.00	0.00	0.04
001336363	POLYCHLORINATED BIPHENYLS	10.17	0.81	0.23	57.43	1.90	0.01
007440020	NICKEL	32.17	17.22	10.71	7.20	6.50	0.08
000107062	1,2-DICHLOROETHANE	0.00	1.59	15.88	0.00	0.00	11.48
000106990	1,3-BUTADIENE	0.00	0.00	0.00	0.00	0.00	.00
000056235	CARBON TETRACHLORIDE	0.00	0.00	0.00	0.00	0.00	0.01
000075218	ETHYLENE OXIDE	0.00	0.00	4.36	0.00	0.00	29.23
000075569	PROPYLENE OXIDE	0.00	0.00	0.00	0.00	0.00	1.34
000117817	DI-(2-ETHYLHEXYL) PHTHALATE	0.13	0.65	0.00	12.22	4.88	1.97
000075014	VINYL CHLORIDE	0.00	0.00	0.00	0.00	0.65	0.00
000106467	1,4-DICHLOROBENZENE	0.00	0.00	0.00	0.00	0.00	0.00
000067630	ISOPROPYL ALCOHOL (MANUF.)	2.38	10.86	0.62	6.87	1.92	2.32
000123911	1,4-DIOXANE	1.84	1.81	1.96	2.46	7.73	14.20
000079061	ACRYLAMIDE	0.00	0.00	0.00	0.00	0.00	0.01
000118741	HEXACHLOROBENZENE	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL	13.75	3.48	1.21	2.82	4.18	1.03

Table D-7. TRI Releases and Transfers for the Top 25 Carcinogens, 1988, continued.

CAS NO.	CHEMICAL	MEASURE./PHOTO. SIC 38 Percent	MISCELLANEOUS SIC 39 Percent	MULTIPLE CODES 20-39 Percent	NO CODES 20-39 Percent
000075092	DICHLOROMETHANE	11.09	2.12	11.89	0.26
000100425	STYRENE	0.27	1.36	8.15	0.16
000127184	TETRACHLOROETHYLENE	2.15	1.53	19.60	0.42
000071432	BENZENE	0.00	0.00	9.86	1.00
000050000	FORMALDEHYDE	0.29	0.00	3.36	0.39
000067663	CHLOROFORM	0.02	0.00	11.46	0.05
000075058	ACETONITRILE	1.36	0.00	0.39	0.32
001332214	ASBESTOS (FRIABLE)	0.00	1.05	21.84	0.01
007439921	LEAD	0.28	0.06	6.28	0.15
007440473	CHROMIUM	0.34	0.00	17.24	0.41
000107131	ACRYLONITRILE	0.04	0.00	3.69	0.00
001336363	POLYCHLORINATED BIPHENYLS (PCBs)	0.01	0.00	3.97	6.80
007440020	NICKEL	0.08	0.22	14.68	0.03
000107062	1,2-DICHLOROETHANE	11.48	0.00	0.62	0.09
000106990	1,3-BUTADIENE	0.00	0.00	11.37	0.00
000056235	CARBON TETRACHLORIDE	0.01	0.00	11.78	0.00
000075218	ETHYLENE OXIDE	29.23	1.39	5.80	9.26
000075569	PROPYLENE OXIDE	1.34	0.00	0.94	0.26
000117817	DI-(2-ETHYLHEXYL) PHTHALATE	1.97	6.12	4.30	0.10
000075014	VINYL CHLORIDE	0.00	0.00	14.46	0.00
000106467	1,4-DICHLOROBENZENE	0.00	0.00	23.38	0.00
000067630	ISOPROPYL ALCOHOL (MANUFACTURING)	2.32	1.63	12.59	1.07
000123911	1,4-DIOXANE	14.20	0.00	7.67	0.00
000079061	ACRYLAMIDE	0.01	0.00	0.00	0.00
000118741	HEXACHLOROBENZENE	0.00	0.00	0.00	0.00
	TOTAL	1.03	0.58	9.29	0.37

Table D-8. Industrial Distribution of TRI Total Releases and Transfers within Each State, 1988, continued.

RANK	STATE	APPAREL		LUMBER		FURNITURE		PAPER		PRINTING	
		Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
22	Alabama	0	0.00	211,412	0.25	1,612,913	1.92	15,738,001	18.72	15,115	0.02
38	Alaska	0	0.00	0	0.00	0	0.00	5,511,392	20.82	0	0.00
53	American Samoa	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
24	Arizona	100	0.00	211,114	0.28	260,587	0.35	3,415,775	4.58	482,500	0.65
25	Arkansas	0	0.00	942,224	1.30	2,289,031	3.17	4,841,401	6.70	24,600	0.03
9	California	92,150	0.05	1,516,766	0.75	2,192,671	1.09	13,381,694	6.64	398,948	0.20
42	Colorado	0	0.00	487,966	2.31	439,106	2.08	254,493	1.20	49,245	0.23
30	Connecticut	0	0.00	22,138	0.04	10,800	0.02	878,215	1.64	157,721	0.30
46	Delaware	0	0.00	0	0.00	0	0.00	120,669	1.13	40,268	0.38
54	District of Columbia	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
6	Florida	0	0.00	167,928	0.07	836,600	0.34	73,488,170	29.44	309,568	0.12
18	Georgia	257,243	0.20	543,089	0.41	729,927	0.56	22,046,475	16.78	1,059,068	0.81
49	Hawaii	0	0.00	2,182	0.07	0	0.00	0	0.00	0	0.00
44	Idaho	0	0.00	289,535	1.92	0	0.00	2,450	0.02	0	0.00
5	Illinois	172,150	0.07	892,865	0.36	1,195,718	0.48	4,026,365	1.60	13,913,042	5.54
4	Indiana	11,600	0.00	3,761,692	1.36	2,953,865	1.07	1,552,657	0.56	7,118,557	2.58
28	Iowa	0	0.00	1,269,724	2.16	671,983	1.15	5,046,134	8.60	1,598,035	2.72
13	Kansas	16,750	0.01	259,033	0.15	0	0.00	20,887	0.01	667,240	0.38
19	Kentucky	250	0.00	33,249	0.03	205,790	0.16	2,293,935	1.75	1,087,902	0.83
1	Louisiana	0	0.00	308,156	0.04	18,949	0.00	16,268,901	2.19	8,422	0.00
41	Maine	0	0.00	194,750	0.89	64,521	0.29	10,801,834	49.18	0	0.00
36	Maryland	0	0.00	74,035	0.22	19,813	0.06	9,310,974	27.93	1,458,040	4.37
26	Massachusetts	95,678	0.14	908,400	1.28	460,824	0.65	8,853,665	12.50	3,417,832	4.83
8	Michigan	102,336	0.04	1,079,271	0.47	4,618,703	1.99	9,965,926	4.30	196,499	0.08
27	Minnesota	0	0.00	2,755,972	4.21	0	0.00	11,651,683	17.79	191,438	0.29
20	Mississippi	44,200	0.04	972,680	0.81	986,362	0.82	1,053,209	0.87	2,693,589	2.23
12	Missouri	0	0.00	31,734	0.02	506,701	0.27	210,069	0.11	1,058,122	0.57
34	Montana	0	0.00	178,647	0.50	0	0.00	498,670	1.41	0	0.00
40	Nebraska	0	0.00	0	0.00	400,887	1.77	144,405	0.64	0	0.00
47	Nevada	0	0.00	2,140	0.04	0	0.00	0	0.00	309,270	6.34
43	New Hampshire	77,584	0.51	275,304	1.81	126,269	0.83	2,221,942	14.65	151,287	1.00
15	New Jersey	0	0.00	78,229	0.05	194,901	0.12	5,432,843	3.34	1,012,054	0.62
39	New Mexico	0	0.00	65,985	0.27	0	0.00	8	0.00	0	0.00
14	New York	139,837	0.08	141,335	0.08	1,336,517	0.78	8,813,285	5.12	2,209,665	1.28
17	North Carolina	55,678	0.04	1,015,112	0.74	18,338,025	13.40	13,928,378	10.18	1,987,171	1.45
52	North Dakota	0	0.00	250	0.02	0	0.00	0	0.00	0	0.00
3	Ohio	369,970	0.10	1,089,285	0.29	1,195,229	0.32	15,746,930	4.19	1,450,614	0.39
31	Oklahoma	0	0.00	54,761	0.11	464,318	0.90	2,707,430	5.23	20,360	0.04
35	Oregon	0	0.00	2,555,803	7.61	19,969	0.06	12,456,554	37.07	22,737	0.07
10	Pennsylvania	104,903	0.05	2,013,463	1.00	2,309,160	1.15	12,163,140	6.05	4,296,379	2.14
37	Puerto Rico	20,099	0.07	2,000	0.01	0	0.00	0	0.00	0	0.00
45	Rhode Island	0	0.00	2,667	0.02	0	0.00	250,573	1.99	48,901	0.39
23	South Carolina	0	0.00	867,634	1.06	637,471	0.78	8,024,685	9.77	774,709	0.94
48	South Dakota	0	0.00	100,266	3.28	0	0.00	0	0.00	1,000	0.03
7	Tennessee	331,863	0.13	638,276	0.26	4,034,113	1.62	8,584,261	3.44	5,077,879	2.04
2	Texas	0	0.00	2,029,728	0.28	807,832	0.11	11,888,834	1.64	323,730	0.04
16	Utah	0	0.00	329,403	0.24	50,754	0.04	2,167	0.00	0	0.00
50	Vermont	0	0.00	187,635	7.90	744,390	31.35	86,236	3.63	26,400	1.11
51	Virgin Islands	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
11	Virginia	0	0.00	1,540,516	0.78	10,704,176	5.44	12,118,943	6.16	5,448,591	2.77
32	Washington	17,361	0.03	1,079,448	2.14	106,294	0.21	17,293,565	34.35	500	0.00
29	West Virginia	0	0.00	936,085	1.62	230,095	0.40	0	0.00	1,980	0.00
21	Wisconsin	9,943	0.01	1,247,656	1.19	1,020,025	0.97	17,245,228	16.42	1,432,948	1.36
33	Wyoming	0	0.00	500	0.00	0	0.00	0	0.00	0	0.00
	TOTAL	**1,919,695**	**0.03**	**33,388,043**	**0.53**	**62,795,289**	**1.01**	**370,343,051**	**5.93**	**60,541,926**	**0.97**

Table D-8. Industrial Distribution of TRI Total Releases and Transfers within Each State, 1988.

RANK	STATE	TOTAL RELEASES AND TRANSFERS		FOOD		TOBACCO		TEXTILES	
		Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
22	Alabama	84,062,842	100.00	327,339	0.39	0	0.00	1,471,512	1.75
38	Alaska	26,476,465	100.00	0	0.00	0	0.00	0	0.00
53	American Samoa	29,500	100.00	28,000	94.92	0	0.00	0	0.00
24	Arizona	74,657,306	100.00	44,696	0.06	0	0.00	68,175	0.09
25	Arkansas	72,272,458	100.00	1,605,915	2.22	36,050	0.05	184,644	0.26
9	California	201,568,789	100.00	13,140,810	6.52	0	0.00	1,153,632	0.57
42	Colorado	21,132,981	100.00	1,387,473	6.57	0	0.00	0	0.00
30	Connecticut	53,449,946	100.00	70,182	0.13	0	0.00	987,594	1.85
46	Delaware	10,692,005	100.00	56,326	0.53	0	0.00	228,000	2.13
54	District of Columbia	1,000	100.00	0	0.00	0	0.00	0	0.00
6	Florida	249,655,746	100.00	1,101,041	0.44	0	0.00	2,468	0.00
18	Georgia	131,410,860	100.00	508,924	0.39	11,585,872	8.82	9,838,296	7.49
49	Hawaii	2,964,331	100.00	1,089,609	36.76	0	0.00	0	0.00
44	Idaho	15,105,613	100.00	744,677	4.93	0	0.00	0	0.00
5	Illinois	251,302,153	100.00	6,611,320	2.63	0	0.00	347,448	0.14
4	Indiana	276,346,921	100.00	1,784,265	0.65	2,870	0.00	34,171	0.01
28	Iowa	58,668,674	100.00	6,137,574	10.46	0	0.00	0	0.00
13	Kansas	174,468,243	100.00	321,540	0.18	0	0.00	0	0.00
19	Kentucky	131,319,642	100.00	422,031	0.32	0	0.00	37,975	0.03
1	Louisiana	741,206,814	100.00	1,022,857	0.14	0	0.00	3,433,472	0.46
41	Maine	21,965,123	100.00	93,083	0.42	0	0.00	542,876	2.47
36	Maryland	33,340,174	100.00	1,279,303	3.84	0	0.00	29,450	0.09
26	Massachusetts	70,821,565	100.00	125,529	0.18	65,981	0.09	1,956,772	2.76
8	Michigan	231,681,301	100.00	1,004,387	0.43	0	0.00	276,517	0.12
27	Minnesota	65,506,519	100.00	1,110,068	1.69	0	0.00	0	0.00
20	Mississippi	120,820,916	100.00	414,608	0.34	0	0.00	5,693,390	4.71
12	Missouri	184,627,555	100.00	957,573	0.52	0	0.00	1,979,432	1.07
34	Montana	35,467,330	100.00	131,000	0.37	0	0.00	0	0.00
40	Nebraska	22,649,337	100.00	463,812	2.05	0	0.00	0	0.00
47	Nevada	4,874,292	100.00	11,450	0.23	0	0.00	0	0.00
43	New Hampshire	15,171,504	100.00	42,600	0.28	0	0.00	272,981	1.80
15	New Jersey	162,741,774	100.00	948,841	0.58	0	0.00	1,424,905	0.88
39	New Mexico	24,398,821	100.00	2,050	0.01	0	0.00	0	0.00
14	New York	172,106,105	100.00	1,448,636	0.84	55,951	0.03	2,757,961	1.60
17	North Carolina	136,857,071	100.00	705,579	0.52	259,906	0.19	11,603,048	8.48
52	North Dakota	1,394,580	100.00	99,127	7.11	0	0.00	0	0.00
3	Ohio	375,989,294	100.00	2,270,780	0.60	0	0.00	1,434,190	0.38
31	Oklahoma	51,720,309	100.00	200,991	0.39	0	0.00	11,000	0.02
35	Oregon	33,604,243	100.00	376,058	1.12	0	0.00	12,000	0.04
10	Pennsylvania	201,102,129	100.00	1,473,203	0.73	84,250	0.04	1,254,348	0.62
37	Puerto Rico	28,842,935	100.00	2,118,212	7.34	7,640	0.03	163,201	0.57
45	Rhode Island	12,568,955	100.00	18,750	0.15	0	0.00	779,043	6.20
23	South Carolina	82,177,534	100.00	260,957	0.32	0	0.00	6,958,625	8.47
48	South Dakota	3,059,629	100.00	410,334	13.41	0	0.00	0	0.00
7	Tennessee	249,417,227	100.00	10,142,380	4.07	537,202	0.22	447,734	0.18
2	Texas	724,477,706	100.00	2,625,463	0.36	0	0.00	968,000	0.13
16	Utah	137,472,389	100.00	302,340	0.22	0	0.00	0	0.00
50	Vermont	2,374,596	100.00	123,554	5.20	0	0.00	0	0.00
51	Virgin Islands	1,633,634	100.00	0	0.00	0	0.00	0	0.00
11	Virginia	196,619,903	100.00	835,512	0.42	804,148	0.41	2,181,041	1.11
32	Washington	50,338,221	100.00	1,379,719	2.74	24,207	0.05	0	0.00
29	West Virginia	57,901,379	100.00	24,975	0.04	1,594,870	2.75	0	0.00
21	Wisconsin	105,049,429	100.00	4,924,838	4.69	0	0.00	791,170	0.75
33	Wyoming	45,464,978	100.00	171,600	0.38	0	0.00	0	0.00
	TOTAL	6,241,030,748	100.00	72,901,891	1.17	15,058,947	0.24	59,325,071	0.95

Table D-8. Industrial Distribution of TRI Total Releases and Transfers within Each State, 198 continued.

RANK	STATE	CHEMICALS		PETROLEUM		PLASTICS		LEATHER	
		Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
22	Alabama	24,124,006	28.70	317,313	0.38	3,762,835	4.48	0	0.00
38	Alaska	20,822,000	78.64	143,073	0.54	0	0.00	0	0.00
53	American Samoa	0	0.00	0	0.00	0	0.00	0	0.00
24	Arizona	999,037	1.34	0	0.00	726,147	0.97	0	0.00
25	Arkansas	28,015,638	38.76	126,910	0.18	6,197,053	8.57	155,556	0.22
9	California	60,467,957	30.00	11,545,440	5.73	8,813,050	4.37	140,582	0.07
42	Colorado	1,653,039	7.82	830,364	3.93	639,921	3.03	130,921	0.62
30	Connecticut	14,307,914	26.77	0	0.00	2,888,823	5.40	0	0.00
46	Delaware	6,608,960	61.81	603,324	5.64	163,918	1.53	0	0.00
54	District of Columbia	1,000	100.00	0	0.00	0	0.00	0	0.00
6	Florida	138,114,269	55.32	1,750	0.00	1,702,278	0.68	0	0.00
18	Georgia	31,843,726	24.23	16,259	0.01	4,235,415	3.22	32,100	0.01
49	Hawaii	1,826	0.06	686,700	23.17	69,975	2.36	0	0.00
44	Idaho	10,043,817	66.49	0	0.00	38,250	0.25	0	0.00
5	Illinois	117,540,084	46.77	4,163,230	1.66	10,856,025	4.32	1,286,216	0.51
4	Indiana	45,394,713	16.43	2,303,554	0.83	16,795,243	6.08	562,618	0.20
28	Iowa	12,786,734	21.79	2,259	0.00	4,828,623	8.23	54,195	0.09
13	Kansas	153,924,567	88.22	4,604,631	2.64	2,223,043	1.27	0	0.00
19	Kentucky	63,633,099	48.46	1,013,673	0.77	3,167,349	2.41	112,165	0.09
1	Louisiana	519,458,187	70.08	20,966,115	2.83	26,075	0.00	0	0.00
41	Maine	455,942	2.08	0	0.00	841,109	3.83	4,715,291	21.47
36	Maryland	7,479,697	22.43	15,550	0.05	209,096	0.63	1,103,683	3.31
26	Massachusetts	8,166,441	11.53	4,000	0.01	4,890,899	6.91	340,383	0.48
8	Michigan	55,306,343	23.91	635,827	0.27	8,338,532	3.60	4,663,273	2.01
27	Minnesota	1,771,797	2.70	296,623	0.45	608,883	0.93	750,833	1.15
20	Mississippi	75,189,476	62.23	1,225,804	1.01	5,606,752	4.64	0	0.00
12	Missouri	81,889,375	44.35	107,454	0.06	6,036,491	3.27	11,987,331	6.49
34	Montana	230,466	0.65	1,139,192	3.21	0	0.00	0	0.00
40	Nebraska	6,221,918	27.47	3,070	0.01	3,665,465	16.18	1,051,962	4.64
47	Nevada	1,119,148	22.96	1,702	0.03	107,568	2.21	0	0.00
43	New Hampshire	688,985	4.54	0	0.00	1,313,372	8.66	11,950	0.08
15	New Jersey	109,952,226	67.56	1,473,056	0.91	4,109,035	2.52	1,478,336	0.91
39	New Mexico	6,623	0.03	405,151	1.66	567	0.00	0	0.00
14	New York	57,770,393	33.57	657,890	0.38	4,379,861	2.54	508,519	0.30
17	North Carolina	49,285,058	36.01	4,193	0.00	8,885,355	6.49	774,977	0.57
52	North Dakota	15	0.00	216,908	15.55	508,067	36.43	0	0.00
3	Ohio	137,666,920	36.61	4,625,381	1.23	13,863,204	3.68	174,087	0.05
31	Oklahoma	18,521,243	35.81	3,610,698	6.98	2,566,031	4.96	0	0.00
35	Oregon	2,557,972	7.61	7,740	0.02	1,095,119	3.26	91,550	0.27
10	Pennsylvania	43,168,533	21.47	5,246,643	2.61	5,732,218	2.85	2,067,017	1.03
37	Puerto Rico	12,743,112	44.18	506,026	1.75	2,834,353	9.83	564,749	1.96
45	Rhode Island	4,406,388	35.06	0	0.00	312,757	2.49	17,250	0.14
23	South Carolina	23,751,650	28.90	1,000	0.00	16,125,472	19.62	0	0.00
48	South Dakota	983,164	32.13	0	0.00	156,588	5.12	0	0.00
7	Tennessee	144,314,984	57.86	144,196	0.06	8,386,825	3.36	339,313	0.14
2	Texas	573,982,836	79.23	29,982,976	4.14	4,858,853	0.67	1,769,046	0.24
16	Utah	1,165,589	0.83	716,167	0.52	153,250	0.11	88	0.00
50	Vermont	264,764	11.15	0	0.00	40,223	1.69	0	0.00
51	Virgin Islands	0	0.00	1,633,634	100.00	0	0.00	0	0.00
11	Virginia	121,843,715	61.97	748,479	0.38	7,844,068	3.99	0	0.00
32	Washington	3,740,529	7.43	1,459,529	2.90	1,627,119	3.23	46,300	0.09
29	West Virginia	37,793,617	65.27	388,005	0.67	452,916	0.78	33,450	0.06
21	Wisconsin	7,631,626	7.26	51,327	0.05	6,462,010	6.15	2,842,495	2.71
33	Wyoming	63,608,176	95.92	1,605,902	3.53	0	0.00	0	0.00
	TOTAL	2,883,479,294	46.20	104,236,707	1.67	189,126,061	3.03	37,806,234	0.61

Table D-8. Industrial Distribution of TRI Total Releases and Transfers within Each State, 1988, continued.

RANK	STATE	STONE/CLAY Pounds	STONE/CLAY Percent	PRIMARY METALS Pounds	PRIMARY METALS Percent	FAB.METALS Pounds	FAB.METALS Percent	MACHINERY Pounds	MACHINERY Percent	ELECTRICAL Pounds	ELECTRICAL Percent
22	Alabama	2,559,458	3.04	14,741,968	17.54	3,069,652	3.65	990,029	1.18	2,442,190	2.91
38	Alaska	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
53	American Samoa	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
24	Arizona	500	0.00	53,916,167	72.22	677,295	0.91	507,143	0.68	6,496,638	8.70
25	Arkansas	286,314	0.40	9,460,284	13.09	2,368,521	3.28	1,373,761	1.90	4,712,823	6.52
9	California	1,578,302	0.78	15,849,060	7.86	14,912,300	7.40	2,870,443	1.42	11,933,924	5.92
42	Colorado	556,530	2.63	4,697,915	22.23	1,747,923	8.27	1,013,161	4.79	1,053,717	4.99
30	Connecticut	45,167	0.08	5,028,287	9.41	7,728,198	14.46	2,158,339	4.04	4,730,664	8.85
46	Delaware	1,750	0.02	66,000	0.62	202,020	1.89	16,039	0.15	12,871	0.12
54	Dist. of Columbia	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
6	Florida	459,477	0.18	3,114,633	1.25	4,792,394	1.92	744,640	0.30	4,239,625	1.70
18	Georgia	2,194,002	1.67	9,350,988	7.12	4,275,582	3.25	2,142,468	1.63	2,525,981	1.92
49	Hawaii	0	0.00	0	0.00	258,793	8.73	0	0.00	0	0.00
44	Idaho	0	0.00	0	0.00	239,807	1.59	301,580	2.00	980,226	6.49
5	Illinois	2,737,482	1.09	39,569,038	15.75	15,848,368	6.31	5,760,982	2.29	6,920,690	2.75
4	Indiana	7,367,593	2.67	69,899,068	25.29	6,777,505	2.45	2,832,846	1.03	14,016,443	5.07
28	Iowa	51,910	0.09	6,480,851	11.05	2,110,708	3.60	2,669,094	4.55	2,856,288	4.87
13	Kansas	704,029	0.40	234,884	0.13	860,390	0.49	563,298	0.32	1,304,454	0.73
19	Kentucky	707,283	0.54	37,695,321	28.71	2,464,949	1.88	2,102,509	1.60	5,082,512	3.87
1	Louisiana	60,177	0.01	5,206,252	0.70	957,408	0.13	175,752	0.02	365,684	0.05
41	Maine	15,845	0.07	0	0.00	224,082	1.02	91,900	0.42	1,310,604	5.97
36	Maryland	395,780	1.19	4,938,915	14.81	2,093,909	6.28	110,929	0.33	820,534	2.46
26	Massachusetts	291,023	0.41	768,802	1.09	4,361,126	6.16	1,222,706	1.73	15,274,375	21.57
8	Michigan	935,107	0.40	63,962,564	27.61	18,060,960	7.79	2,055,227	0.89	1,432,520	0.62
27	Minnesota	150,153	0.23	1,010,598	1.54	6,062,494	9.22	2,850,768	4.35	21,885,321	33.41
20	Mississippi	6,635,017	5.49	449,328	0.37	4,163,906	3.45	886,151	0.73	1,087,175	0.90
12	Missouri	360,547	0.20	44,362,009	24.03	5,377,599	2.91	987,331	0.53	6,346,635	3.44
34	Montana	0	0.00	33,250,946	93.75	0	0.00	0	0.00	0	0.00
40	Nebraska	2,298	0.01	2,372,287	10.47	954,014	4.21	697,039	3.08	1,299,001	5.74
47	Nevada	4,276	0.09	133,636	2.76	81,000	1.66	0	0.00	250	0.01
43	New Hampshire	34,550	0.23	699,740	4.61	163,958	1.08	1,000,206	6.59	3,713,240	24.48
15	New Jersey	667,643	0.41	13,436,203	8.26	8,442,539	5.19	1,678,488	1.03	2,152,645	1.32
39	New Mexico	0	0.00	22,839,754	93.61	0	0.00	44,000	0.18	665,922	2.73
14	New York	1,823,570	1.06	8,571,136	4.98	6,584,711	3.83	3,830,287	2.23	8,309,553	4.83
17	North Carolina	444,006	0.32	2,055,707	1.50	4,980,242	3.64	2,256,175	1.65	4,899,895	3.58
52	North Dakota	161,000	11.54	0	0.00	43,277	3.10	242,866	17.41	0	0.00
3	Ohio	5,439,640	1.45	79,284,564	21.09	26,072,386	6.93	8,856,564	2.36	9,663,737	2.57
31	Oklahoma	488,734	0.94	4,575,740	8.85	3,177,738	6.14	2,694,835	5.21	744,725	1.44
35	Oregon	48,100	0.14	4,776,718	16.21	521,601	1.55	268,344	0.80	1,062,546	3.16
10	Pennsylvania	2,938,742	1.46	73,319,754	36.46	9,306,851	4.63	2,353,506	1.17	7,359,418	3.66
37	Puerto Rico	43,948	0.15	15,362	0.05	416,429	1.44	411,900	1.43	895,916	3.11
45	Rhode Island	408,030	3.25	221,776	1.76	2,526,752	20.10	42,001	0.33	212,993	1.69
23	South Carolina	754,069	0.92	3,512,939	4.27	4,049,364	4.93	1,052,263	1.28	3,604,297	4.39
48	South Dakota	159,689	5.22	86,600	2.83	194,408	6.35	529,672	17.31	300,901	9.83
7	Tennessee	7,210,834	2.89	13,586,098	5.45	3,468,161	1.39	2,671,406	1.07	2,373,315	0.95
2	Texas	2,804,594	0.39	41,087,394	5.67	12,464,385	1.72	2,943,543	0.41	5,861,233	0.81
16	Utah	50,170	0.04	126,433,441	91.97	273,530	0.20	76,138	0.06	1,322,165	0.96
50	Vermont	0	0.00	26,081	1.10	103,395	4.35	160,046	6.74	253,541	10.68
51	Virgin Islands	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
11	Virginia	890,537	0.45	1,962,709	1.00	4,708,968	2.39	188,365	0.10	3,528,505	1.79
32	Washington	18,809	0.04	2,339,309	4.65	3,261,339	6.48	189,868	0.38	958,209	1.90
29	West Virginia	728,148	1.26	11,966,098	20.67	1,519,716	2.62	1,266,822	2.19	96,476	0.17
21	Wisconsin	1,967,897	1.87	20,509,585	19.52	12,123,803	11.54	7,450,632	7.09	5,276,437	5.02
33	Wyoming	0	0.00	0	0.00	78,050	0.17	0	0.00	0	0.00
	TOTAL	55,182,710	6.88	887,866,507	13.78	218,112,500	3.45	75,332,062	1.21	182,384,794	2.92

Table D-8. Industrial Distribution of TRI Total Releases and Transfers within Each State, 1988, continued.

RANK	STATE	TRANSPORTATION		MEASURE./PHOTO		MISCELLANEOUS		MULTIPLE SIC CODES		NO SIC CODES	
		Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
22	Alabama	4,572,288	5.44	271,186	0.32	1,196,319	1.42	4,750,219	5.65	1,889,087	2.25
38	Alaska	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
53	American Samoa	0	0.00	0	0.00	0	0.00	1,500	5.08	0	0.00
24	Arizona	2,093,173	2.80	475,687	0.64	2,392,334	3.20	1,796,647	2.41	93,591	0.13
25	Arkansas	3,230,698	4.47	407,739	0.56	1,203,004	1.66	4,035,836	5.58	774,456	1.07
9	California	24,836,337	12.32	3,755,129	1.86	1,081,806	0.54	10,612,376	5.26	1,295,412	0.64
42	Colorado	664,312	3.14	1,659,988	7.85	26,480	0.13	3,463,957	16.39	376,470	1.78
30	Connecticut	7,523,030	14.07	734,273	1.37	475,456	0.89	5,179,915	9.69	523,250	0.98
46	Delaware	2,317,237	21.67	95,857	0.90	0	0.00	22,000	0.21	136,766	1.28
54	Dist. of Columbia	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
6	Florida	10,903,844	4.37	1,454,073	0.58	4,429,988	1.77	2,856,336	1.14	904,564	0.36
18	Georgia	6,965,406	5.30	514,851	0.39	414,076	0.32	19,789,552	15.06	573,663	0.44
49	Hawaii	0	0.00	0	0.00	10,796	0.36	844,450	28.49	0	0.00
44	Idaho	1,850	0.01	0	0.00	5,375	0.04	2,432,046	16.10	26,000	0.17
5	Illinois	8,915,396	3.55	1,180,169	0.47	1,301,263	0.52	7,391,873	2.94	672,431	0.27
4	Indiana	13,908,278	5.03	460,686	0.17	2,582,412	0.93	74,436,719	26.94	1,791,566	0.65
28	Iowa	1,482,235	2.53	24,000	0.04	1,811,997	3.09	8,548,904	14.57	237,435	0.40
13	Kansas	1,983,933	1.14	38,249	0.02	263,095	0.15	5,335,359	3.06	1,142,861	0.66
19	Kentucky	4,805,231	3.66	0	0.00	671,539	0.51	5,525,962	4.21	256,918	0.20
1	Louisiana	3,024,651	0.41	0	0.00	24,000	0.00	169,361,287	22.85	520,469	0.07
41	Maine	963,696	4.39	16,021	0.07	3,900	0.02	1,608,725	7.32	20,944	0.10
36	Maryland	2,628,631	7.88	45,930	0.14	0	0.00	1,309,174	3.93	16,731	0.05
26	Massachusetts	957,549	1.35	5,083,837	7.18	1,038,668	1.47	12,528,037	17.69	9,040	0.01
8	Michigan	42,834,305	18.49	2,400	0.00	609,563	0.26	15,186,868	6.56	354,173	0.15
27	Minnesota	3,634,446	5.55	1,127,195	1.72	13,650	0.02	8,625,819	13.17	1,028,778	1.57
20	Mississippi	1,239,398	1.03	132,150	0.11	215,188	0.18	12,115,289	10.03	17,246	0.01
12	Missouri	14,213,073	7.70	415,806	0.23	373,679	0.20	6,125,649	3.32	1,300,945	0.70
34	Montana	16,380	0.05	22,029	0.06	0	0.00	0	0.00	0	0.00
40	Nebraska	492,165	2.17	1,339,565	5.91	0	0.00	3,506,069	15.48	35,400	0.16
47	Nevada	0	0.00	42,662	0.88	36,900	0.76	3,024,040	62.04	250	0.01
43	New Hampshire	250,280	1.65	60,378	0.40	759,650	5.01	3,307,228	21.80	0	0.00
15	New Jersey	3,033,439	1.86	2,201,906	1.35	461,781	0.28	4,015,680	2.47	547,024	0.34
39	New Mexico	323,386	1.33	0	0.00	2,750	0.01	39,275	0.16	3,350	0.01
14	New York	6,031,839	3.50	29,933,140	17.39	1,279,723	0.74	21,942,970	12.75	3,579,326	2.08
17	North Carolina	4,430,963	3.24	653,574	0.48	830,405	0.61	9,181,995	6.71	281,629	0.21
52	North Dakota	12,500	0.90	0	0.00	42,470	3.05	37,000	2.65	31,100	2.23
3	Ohio	23,370,074	6.22	924,502	0.25	1,519,073	0.40	39,811,068	10.59	1,181,096	0.31
31	Oklahoma	4,889,754	9.45	3,391,653	6.56	35,414	0.07	3,528,690	6.82	36,194	0.07
35	Oregon	1,637,176	4.87	513,114	1.53	201,375	0.60	5,379,767	16.01	0	0.00
10	Pennsylvania	5,272,120	2.62	1,629,817	0.81	5,370,194	2.67	13,347,617	6.64	290,853	0.14
37	Puerto Rico	336	0.00	1,086,440	3.77	97,383	0.34	6,890,092	23.89	25,737	0.09
45	Rhode Island	1,042,805	8.30	294,973	2.35	1,204,872	9.59	714,456	5.68	63,970	0.51
23	South Carolina	2,131,831	2.59	1,173,577	1.43	294,120	0.36	8,128,101	9.89	74,770	0.09
48	South Dakota	95,400	3.12	0	0.00	41,607	1.36	0	0.00	0	0.00
7	Tennessee	8,664,581	3.47	429,940	0.17	741,489	0.30	27,031,409	10.84	260,968	0.10
2	Texas	9,667,690	1.33	651,929	0.09	503,884	0.07	17,391,387	2.40	1,864,371	0.26
16	Utah	5,097,224	3.71	1,192,691	0.87	158,199	0.12	155,743	0.11	15,350	0.01
50	Vermont	213,009	8.97	0	0.00	55,364	2.33	89,958	3.79	0	0.00
51	Virgin Islands	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
11	Virginia	4,387,722	2.23	196,250	0.10	426,249	0.22	16,233,741	8.26	27,668	0.01
32	Washington	11,108,615	22.07	377,387	0.75	334,722	0.66	4,307,115	8.56	668,277	1.33
29	West Virginia	73,250	0.13	0	0.00	1,000	0.00	693,327	1.20	100,551	0.17
21	Wisconsin	5,238,559	4.99	356,895	0.34	1,500,144	1.43	6,875,294	6.54	90,917	0.09
33	Wyoming	0	0.00	0	0.00	0	0.00	0	0.00	750	0.00
	TOTAL	261,180,095	4.18	64,367,648	1.03	38,043,356	0.58	579,516,521	9.29	23,142,344	0.37

APPENDIX E

SECTION 313 EPA REGIONAL CONTACTS

Region 1

Pesticides & Toxics Branch
USEPA Region 1 (APT2311)
JFK Federal Building
Boston, MA 02203
(617) 565-3273

Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont

Region 2

Pesticides & Toxics Branch
USEPA Region 2 (MS240)
Woodbridge Avenue, Building 209
Edison, NJ 08837
(201) 906-6890

New Jersey, New York, Puerto Rico, Virgin Islands

Region 3

Toxics & Pesticides Branch
USEPA Region 3 (3HW42)
841 Chestnut Street
Philadelphia, PA 19107
(215) 597-1260

Delaware, Maryland, Pennsylvania, Virginia, West Virginia, District of Columbia

Region 4

Pesticides & Toxics Substances Branch
USEPA Region 4
345 Courtland Street
Atlanta, GA 30365
(404) 347-5053

Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee

Region 5

Pesticides & Toxic Substances Branch
USEPA Region 5 (5SPT-7)
536 South Dearborn Street
Chicago, IL 60604
(312) 353-5867

Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin

Region 6

Pesticides & Toxic Substances Branch
USEPA Region 6 (6TPT)
1445 Ross Avenue
Dallas, TX 75202-2733
(214) 655-7244

Arkansas, Louisiana, New Mexico, Oklahoma, Texas

Region 7

Office of Congressional and Intergovernmental Liaison
USEPA Region 7 (CIGL)
726 Minnesota Avenue
Kansas City, KS 66101
(913) 236-2806

Iowa, Kansas, Missouri, Nebraska

Region 8

Toxic Substances Branch
USEPA Region 8 (8AT-TS)
999 18th Street
Denver, CO 80202-2405
(303) 293-1730

Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming

Region 9

Pesticides & Toxics Branch
USEPA Region 9 (T-5-3)
215 Fremont Street
San Francisco, CA 94105
(415) 974-7054

Arizona, California, Hawaii, Nevada, American Samoa, Guam, Commonwealth of the Northern Mariana Islands

Region 10

Pesticides & Toxic Substances Branch
USEPA Region 10 (AT083)
1200 Sixth Avenue
Seattle, WA 98101
(206) 442-1091

Alaska, Idaho, Oregon, Washington

STATE DESIGNATED SECTION 313 CONTACTS

[Note: Use the appropriate address for submission of Form R reports to your State.]

Alabama
Mr. E. John Williford, Chief of Operations
Alabama Emergency Response Commission
Alabama Department of Environmental Management
Field Operations Division
1751 Congressman W.G. Dickinson Drive
Montgomery, AL 36109
(205) 271-7700

Alaska
Ms. Amy Kyle, Chairman
Alaska Emergency Response Commission
Department of Environmental Conservation
P.O. Box 0
Juneau, AK 99811
(907) 465-2600

American Samoa
Mr. Pati Faiai, Director
American Samoa EPA
Office of the Governor
Pago Pago, AS 96799
International Number (684) 633-2682

Arizona
Mr. Carl F. Funk, Executive Director
Arizona Emergency Response Commission
5636 East McDowell Road
Phoenix, AZ 85008
(602) 244-0504

Arkansas
Ms. Becky Bryant
Depository of Documents
Arkansas Department of Labor
10421 West Markham
Little Rock, AR 72205
(501) 682-4534

California
Mr. Charles M. Shulock
Office of Environmental Affairs
P.O. Box 2815
Sacramento, CA 95812
Attn: Section 313 Reports
(916) 324-8124
(916) 322-7236 (Completed Form R information)

Colorado
Colorado Emergency Planning Commission
Colorado Department of Health
Division of Hazardous Materials and Waste Management
4210 East 11th Avenue
Denver, CO 80220
Ms. Pam Harley (303) 331-4858
Mr. Richard Bardsley (303) 273-1789

Commonwealth of the Northern Marianas Islands
Mr. Russell Meecham, III
Division of Environmental Quality
P.O. Box 1304
Saipan, MP 96950
(670) 234-6984

Connecticut
Ms. Sue Vaughn
State Emergency Response Commission
Department of Environmental Protection
Room 161
165 Capitol Avenue
Hartford, CT 06106
(203) 566-4856

Delaware
Mr. Phillip G. Retallick
Division of Air and Waste Management
Department of Natural Resources and Environmental Control
Richardson and Robbins Building
89 Kings Highway
Dover, DE 19901
(302) 736-4764

District of Columbia
Ms. Pamela Thurber
Environmental Planning Specialist
Office of Emergency Preparedness
2000 14th Street, NW, 8th Floor
Washington, DC 20009
(202) 727-6161

Florida
Mr. Thomas G. Pelham, Chairman
Florida Emergency Response Commission
Secretary, Florida Department of Community Affairs
2740 Centerview Drive
Tallahassee, FL 32399-2149
(904) 487-1472
(in Florida 800-635-7179)

Georgia
Mr. Jimmy Kirkland
Georgia Department of Natural Resources
205 Butler Street, S.E.
Floyd Tower East
Atlanta, GA 30334
(404) 656-6905

Guam
Mr. Charles P. Crisostomo
Guam EPA
P.O. Box 2999
Agana, GU 96910
(671) 646-8863

Hawaii
Dr. John C. Lewin, M.D., Director
Hawaii State Department of Health
P.O. Box 3378
Honolulu, HI 96801-9904
(808) 548-6505

Idaho
Ms. Jennie Records, Program Coordinator
Idaho Emergency Response Commission
State House
Boise, ID 83720
(208) 334-5898

Illinois
Mr. Joe F. Goodner, P.E.
Emergency Planning Unit
Illinois EPA
P.O. Box 19276
2200 Churchill Road
Springfield, IL 62794-9276
(217) 782-3637

Indiana
Mr. Philip Powers, Director
Indiana Department of Environmental Management
Emergency Response Branch
5500 West Bradbury Avenue
Indianapolis, IN 46241
(317) 243-5176
(317) 243-5147 (General information only)

Iowa
Mr. Jim Taylor
Iowa Emergency Response Commission
301 East 7th Street
Des Moines, IA 50319
(515) 281-6175

Kansas
Right-to-Know Program
Kansas Department of Health and Environment
Building 740, Forbes Field
Topeka, KS 66620-7430
(913) 296-1690

Kentucky
Ms. Valerie Hudson
Kentucky Department of Environmental Protection
18 Reilly Road
Frankfort, KY 40601
(502) 564-2150

Louisiana
Mr. R. Bruce Hammatt
Emergency Response Coordinator
Department of Environmental Quality
P.O. Box 44091
Baton Rouge, LA 70804-4091
(504) 342-6363

Maine
Mr. David Brown, Director
State Emergency Response Commission
State House Station 72
State Office Building
Augusta, ME 04333
(207) 289-4080
(In Maine 800-452-8735)

Maryland
Ms. Masha Ways
Toxics Information Center
SARA Title III
c/o Maryland Department of the Environment
O'Conor State Office Building
2500 Broening Highway
Baltimore, MD 21224
(301) 631-3800

Massachusetts
Mr. Arnold Sapenter
c/o Title III Emergency Response Commission
Department of Environmental Quality Engineering
One Winter Street, 10th Floor
Boston, MA 02108
(617) 292-5810

Michigan
Mr. David Warner, Director
Michigan Department of Natural Resources
Environmental Response Division
Title III Notification
P.O. Box 30028
Lansing, MI 48909
(517) 373-8481

Minnesota
Mr. Lee Tischler, Director
Minnesota Emergency Response Commission
Division of Emergency Management
Room B5
State Capitol
St. Paul, MN 55155
(612) 296-2233

Mississippi
Mr. J.E. Maher, Chairman
Mississippi Emergency Response Commission
Director, Mississippi Emergency Management Agency
P.O. Box 4501
Fondren Station
Jackson, MI 39296-4501
(601) 960-9973

Missouri
Mr. Dean Martin, Coordinator
Missouri Emergency Response Commission
Missouri Department of Natural Resources
P.O. Box 3133
Jefferson City, MO 65102
(314) 751-7929

Montana
Mr. Tom Ellerhoff, Co-Chairman
Montana Emergency Response Commission
Environmental Sciences Division
Department of Health and Environmental Sciences
Cogswell Building A-107
Helena, MT 59620
(406) 444-3948

Nebraska
Mr. Craig Bagstad
Technical Services Section
Nebraska Department of Environmental Control
P.O. Box 98922
State House Station
Lincoln, NE 68509-8922
(402) 471-4230

Nevada
Mr. Bob King, Director
Division of Emergency Management
2525 South Carson
Carson City, NV 89710
(702) 885-4240

New Hampshire
Mr. Richard H. Strome, Director
State Emergency Management Agency
State Office Park South
107 Pleasant Street
Concord, NH 03301
(603) 271-2231

New Jersey
Richard A. Dime
Department of Environmental Protection
Division of Environmental Quality
CN-405
Bureau of Hazardous Waste Information
SARA Title III Project
401 East State Street
Trenton, NJ 08625
(609) 292-6714

New Mexico
Mr. Sam Larcombe
New Mexico Emergency Response Commission
New Mexico Department of Public Safety
P.O. Box 1628
Santa Fe, NM 87504-1628
(505) 827-9222

New York
New York Department of Environmental Conservation
Bureau of Spill Response
SARA Title III Section 313
50 Wolf Road
Albany, NY 12233
(518) 457-4107

North Carolina
Mr. Vance E. Kee
North Carolina Division of Emergency Management
116 West Jones Street
Raleigh, NC 27603-1335
(919) 733-3867

North Dakota
Mr. Dean Monteith, Coordinator
North Dakota Emergency Response Commission
North Dakota State Department of Health and Consolidated Laboratories
1200 Missouri Avenue
P.O. Box 5520
Bismarck, ND 58502-5520
(701) 224-2374

Ohio
Ms. Cindy Sferra-DeWulf
Division of Air Pollution Control
1800 Watermark Drive
Columbus, OH 43215
(614) 644-2270

Oklahoma
Mr. Jack W. Muse, Coordinator
Emergency Response Commission
Office of Civil Defense
P.O. Box 53365
Oklahoma City, OK 73152
(405) 521-2481

Oregon
Oregon Emergency Response Commission
c/o Oregon State Fire Marshall
3000 Market Street Plaza
Suite 534
Salem, OR 97310
(503) 378-2885

Pennsylvania
Mr. James Tinney
Bureau of Right-to-Know
Room 1503
Labor and Industry Bldg.
Harrisburg, PA 17120
(717) 783-8150

Puerto Rico
SERC Commissioner
Title III - SARA Section 313
Puerto Rico Environmental Quality Board
P.O. Box 11488
Santurce, PR 00910
(809) 722-0077

Rhode Island
Department of Environmental Management
Division of Air and Hazardous Materials
291 Promenade Street
Providence, RI 02908-5767
Attn: Toxic Release Inventory
(401) 277-2808

South Carolina
Mr. Ron Kinney
Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201
(803) 734-5200

South Dakota
Mr. Brad Schultz
South Dakota Emergency Response Commission
Department of Water and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181
(605) 773-3153

Tennessee
Mr. Lacy Suiter, Chairman
Tennessee Emergency Response Commission
Director, Tennessee Emergency Management Agency
3041 Sidco Drive
Nashville, TN 37204-1502
1-800-262-3300 (In Tennessee)
1-800-258-3300 (Out of state)

Texas
Mr. David Barker, Supervisor
Emergency Response Unit
Texas Water Commission
P.O. Box 13087 - Capitol Station
Austin, TX 78711-3087
(512) 463-8527

Utah
Mr. Neil Taylor
Utah Hazardous Chemical Emergency Response Commission
Utah Division of Environmental Health
288 North 1460 West
P.O. Box 16690
Salt Lake City, UT 84116-0690
(801) 538-6121

Vermont
Dr. Jan Carney, Deputy Commissioner
Department of Health
60 Main Street
P.O. Box 70
Burlington, VT 05402
(802) 863-7281

Virginia
Mr. Wayne Halbleib, Director
Virginia Emergency Response Council
Department of Waste Management
James Monroe Building
18th Floor
101 North 14th Street
Richmond, VA 23219
(804) 225-2513

Virgin Islands
Mr. Allan D. Smith, Commissioner
Department of Planning and Natural Resources
U.S. Virgin Islands Emergency Response Commission
Title III
179 Altona and Welgunst
Charlotte Amalie
St. Thomas, VI 00802
(809) 774-3320

Washington
Washington Emergency Response Commission
Department of Community Development
Mail Stop GH-51
9th & Columbia Building
Olympia, WA 98504
(800) 633-7585

West Virginia
Mr. William Pinnell
Office of Environmental Health Services
West Virginia Department of Health
1800 East Washington Street East
Room 507
Charleston, WV 25305
(304) 348-2967

Wisconsin
Wisconsin Department of Natural Resources
Office of Technical Services TS-2
P.O. Box 7921
Madison, WI 53707
(608) 266-9255
Attn: Russ Dunst

Wyoming
Mr. Ed Usui, Coordinator
Wyoming Emergency Response Commission
Wyoming Emergency Management Agency
Comprehensive Emergency Management
5500 Bishop Blvd.
Cheyenne, WY 82003
(307) 777-7566

[Notes: (1) If an Indian tribe has chosen to act independently of a state for the purpose of section 313 reporting, facilities located within that Indian community should report to the tribal SERC, or until the SERC is established, the Chief Executive Officer of the Indian tribe, as well as to EPA; (2) Facilities located within the Territories of the Pacific should send a report to the Chief Administrator of the appropriate territory, as well as to EPA.]

TRI DEFINED

TRI (the Toxic Chemical Release Inventory) contains information on the annual estimated releases of toxic chemicals to the environment. Based upon data collected by the Environmental Protection Agency (EPA), this file is publicly accessible on the National Library of Medicine's (NLM) Toxicology Data Network (TOXNET).

TRI BACKGROUND

Mandated by Title III of the SUPERFUND Amendments and Reauthorization Act (SARA) of 1986, the Inventory contains provisions for the reporting, by industry, on the releases of over 300 toxic chemicals into the air, water, and land. Data submitted to EPA include names and addresses of facilities which manufacture, process, or otherwise use these chemicals, as well as amounts released to the environment or tranferred to waste sites. Title III, also known as the Emergency Planning and Community Right-to-Know Act, calls for the EPA to collect this data nationwide on an annual basis. The Law mandates that the data be made publicly available through a computer database. The online **TRI** file should appeal to a broad based user audience including industry, state and local environmental agencies, emergency planning committees, the Federal Government, and other regulatory groups. Another important user group is likely to be concerned citizens who, on their own or through public interest groups and public libraries, can use **TRI** to ask questions about chemical releases in their communities.

TRI FILE STRUCTURE

TRI data is arranged in the following broad categories:

Facility Identification
Substance Identification
Environmental Release of Chemical
Waste Treatment
Off-Site Waste Transfer

The data include the names, addresses and public contacts of plants manufacturing, processing or using the reported chemicals, the maximum amount stored on site, the estimated quantity emitted into the air (point and non-point emissions), discharged into bodies of water, injected underground, or released to land, methods used in waste treatment and their efficiency, and data on the transfer of chemicals off-site for treatment/disposal, either to publicly owned treatment works or elsewhere.

SEARCHING TRI

TRI is a component file of NLM's TOXNET system. Utilizing a free text search capability, full Boolean logic, a powerful and flexible command language and a variety of online user assistance features, TOXNET offers state-of-the-art user-friendly searching. Online and offline printing of entire or specified portions of records is available, as are a variety of customized print options. Special **TRI** features allow sorting and numerical manipulation of data. A menu-driven search package also allows novice users or individuals with limited computer skills to search **TRI** efficiently.

TRI IN ACTION

TRI users can ask such questions as:

- How much benzene was reported released to waterways in 1987 by Virginia industrial plants?
- What waste minimization methods are reported by Marin County manufacturers of toluene?
- How much chlorine gas have entire plants of Company XYZ released into the air last year throughout the country?
- What are the names and addresses of Baltimore steel plants importing lead?
- What quantity of sulfuric acid at Boston's ABC Waste Treatment Facility is transferred there from outside the State of Massachusetts?

TRI AVAILABILITY

TRI is available 24 hours/day, 7 days/week, except for a brief daily maintenance period.

TRI ACCESS

Registered NLM online services users are able to access **TRI** on the TOXNET system by direct dial or through various telecommunication networks including TELENET, TYMNET, or COMPUSERVE. **TRI** users also automatically have access to all TOXNET files and can access other NLM files, through the TOXNET Gateway. In addition to TRI, TOXNET contains HSDB (Hazardous Substances Data Bank), RTECS (Registry of Toxic Effects of Chemical Substances), CCRIS (Chemical Carcinogenesis Research Information System), ETICBACK (Environmental Teratology Information Center Backfile), EMIC BACK (Environmental Mutagen Information Center), and DBIR (Directory of Biotechnology Information Resources). Other NLM files, such as the TOXLINE/TOXLIT group, containing some 2.5 million references on literature related to toxic chemicals, may be used to obtain supporting information in such areas as health hazards and emergency handling of **TRI** chemicals.

TRI USER SERVICES

For further information about the TRI file, contact:

TRI Representative
Specialized Information Services
National Library of Medicine
8600 Rockville Pike
Bethesda, MD 20894
Telephone (301) 496-6531